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OPERATOR'S, ORGANIZATIONAL, FIELD, AND DEPOT MAINTENANCE MANUAL FOR CV-1750/U ELECTRONIC FREQUENCY CONVERTER AND FE-25-1 FREQUENCY EXTENDER

MP MASTER
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CEI
COMMUNICATION ELECTRONICS, INC.
6006 EXECUTIVE BOULEVARD ROCKVILLE, MARYLAND, 20852

OPERATOR'S, ORGANIZATIONAL, FIELD,

AND DEPOT MAINTENANCE MANUAL

FOR

CV-1750/U ELECTRONIC FREQUENCY CONVERTER
(FSN 5820-070-7967)

AND

FE-25-1 FREQUENCY EXTENDER

COMMUNICATION ELECTRONICS, INC.
6006 EXECUTIVE BOULEVARD
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Change 2
5/16/66

WARNING

Be careful when working on the 115-volt ac line connections. Serious injury or death may result from contact with these terminals.

ELECTRONIC FREQUENCY CONVERTER, CV-1750/U

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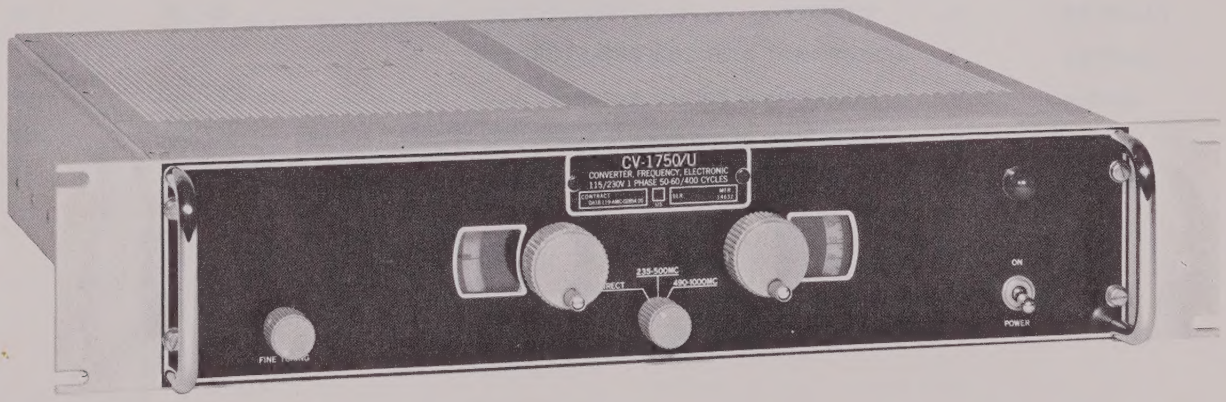


Figure 1. Electronic Frequency Converter CV-1750/U, Front View

CHAPTER 1

INTRODUCTION

Section I. General

1. Scope

This technical manual describes the Electronic Frequency Converter CV-1750/U (hereafter called frequency converter) and covers its installation, operation, theory, and maintenance. It includes operation under usual conditions, cleaning and inspection of the equipment, replacement of parts, trouble-shooting alignment procedures and repair applicable to all echelons of maintenance.

2. Forms and Records

Reports of damage or improper shipment and comments on this manual should be forwarded to the appropriate office for the using agency. Records on the equipment should be maintained in accordance with regulations of the using agency.

Section II. Description and Data

3. Purpose and Use

The frequency converter is used to extend the frequency range of any receiver which tunes to 60 mc. The frequency converter's range is from 235 mc to 1000 mc in two bands. The low band frequency is 235 mc to 500 mc, and the high band frequency is 490 mc to 1000 mc.

a. The frequency converter is designed for use with any receiver which may be tuned to 60 mc and any antenna in the range of 235 mc to 1000 mc which operates unbalanced and has an output impedance of 50 ohms.

b. Figure 2 is a simplified block diagram of the frequency converter showing the interrelationship of the high and low band r-f tuners and the antenna input. When a DIRECT input is selected for an antenna below 235 mc, it is applied directly to the output of the frequency converter through the band selector circuit. When a LOW input is selected for an antenna in the 235 mc to 500 mc range, it is applied to two r-f amplifiers in series and then to a mixer. This input is combined with the output from a local oscillator and the resultant 60-mc i-f output of the mixer is applied to the frequency converter output through the band selector circuit. When a HIGH input is selected for an antenna in the 490 mc to 1000 mc range, it is applied to a series of preselectors and combined in a crystal detector with the output from a local oscillator. The difference frequency is applied to a 60-mc cascode amplifier where the 60 mc i-f signal is fed to the frequency converter output through the band selector circuit.

4. Technical Characteristics

Frequency range	
Low band	235 mc-500 mc
High band	490 mc-1000 mc
Input Impedance	Suitable for 50-ohm source
Noise figure	
Low band	10 db, maximum
High band	12 db, maximum
Image rejection	65 db, minimum
I-F rejection	75 db, minimum
Output	
Frequency	60 mc
Bandwidth	2 mc
Impedance	Suitable for 50-ohm load
Oscillator to Antenna Conduction	
Low band	8 μv, maximum

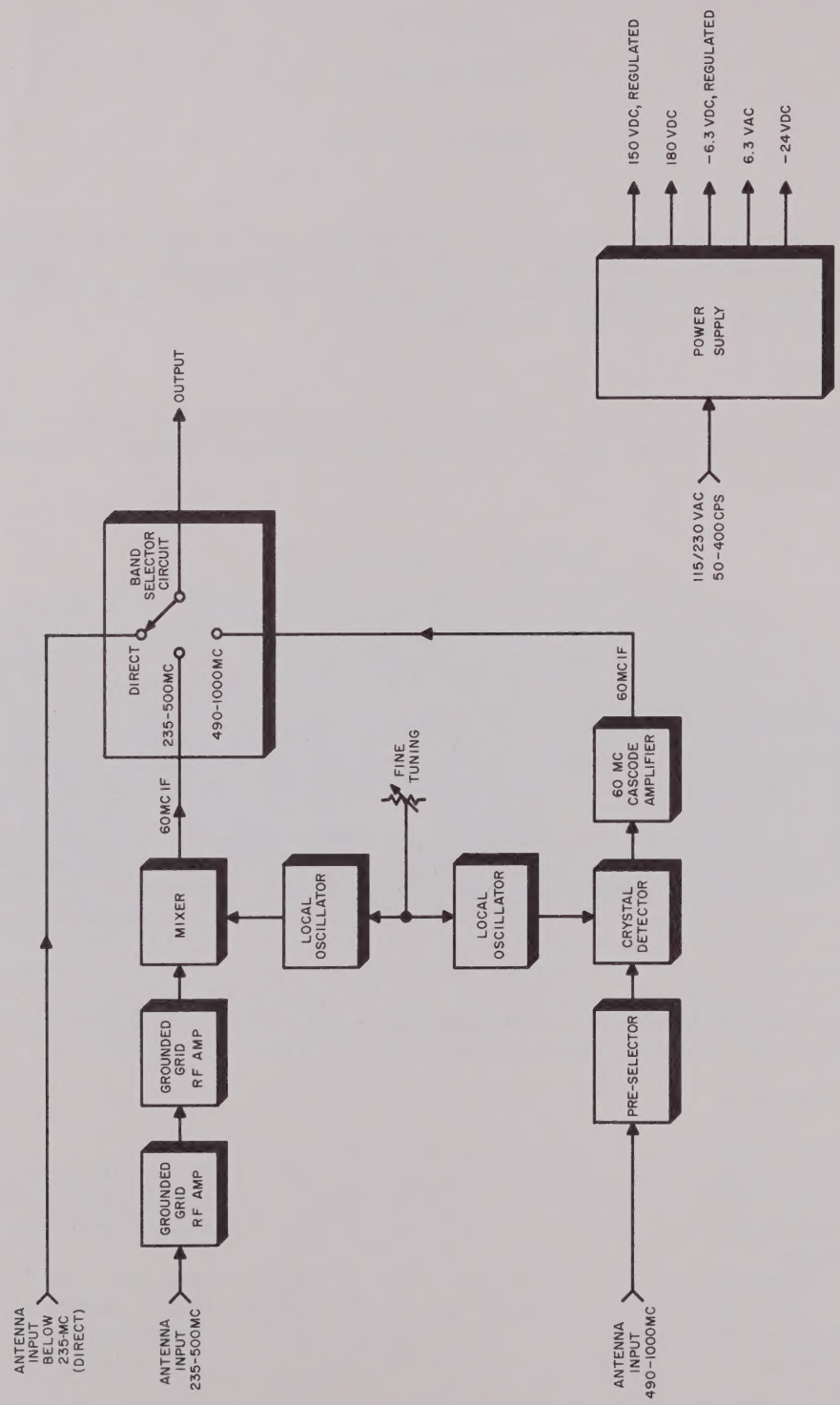


Figure 2. Electronic Frequency Converter CV-1750/U, Block Diagram

High band	75 μv, maximum
Power	
Input	115 vac or 230 vac, 50-60/400 cps
Consumption	30 watts, maximum
Ambient temperature range	0 to 55°C
Number of tubes	7
Weight	15 lbs.
Size	19 in. x 3.5 in. x 14 in.

5. Components of Electronic Frequency Converter CV-1750/U

a. Components. This equipment consists of Electronic Frequency Converter CV-1750/U only. The dimensions and weight are 19 in. x 3.5 in. x 14 in. and 15 lbs.

b. Running Spares. The following spares are supplied if procured under contract.

Qty	Item
5	Fuse (Bussman Slow-Blow), 0.15-ampere
5	Fuse (Bussman Slow-Blow), 0.3-ampere
1	Lamp (GE 47), 6.3 volts, 0.15-ampere
1	Lamp (GE 345), 6.3 volts, 0.04-ampere
	Electron tubes:
1	GE 7077
1	GE 7486
1	RCA 6CW4
1	RCA 7587

6. Description of Electronic Frequency Converter CV-1750/U

The frequency converter consists of a plug-in power supply module, a high (490 mc-1000 mc) band tuner, and a low (235 mc-500 mc) band tuner. Inputs may be from antennas below 235 mc (direct), from 235 mc to 500 mc, or, from 490 mc to 1000 mc. All input and output connections are made in the rear of the unit and selected by front panel switching. A fine tuning control is also located on the front panel. The frequency converter is designed to operate with any receiver which will tune to 60 mc.

7. Additional Equipment Required

The following equipment is not supplied as part of the Electronic Frequency Converter CV-1750/U, but is needed for use with the unit:

a. Receiver. Any receiver capable of tuning to 60 mc with an input impedance of 50 ohms.

b. Cable. A coaxial cable with a BNC type UG-88/U (FSN 5935-823-0833) plug to connect to a BNC receptacle jack to interconnect the receiver and the frequency converter.

c. Less than 235 mc Antenna. Any antenna operating below a frequency of 235 mc, having an output impedance of 50 ohms, unbalanced, with an RG-55 coaxial cable with an N type UG-536A/U (FSN 5935-642-0482) plug to connect to an N type UG-1052/U receptacle jack.

d. 235 mc-500 mc Antenna. Any antenna operating within a frequency range of 235 mc to 500 mc, having an output impedance of 50 ohms, unbalanced. It must have an RG-55 coaxial cable with an N type UG-536A/U plug to connect to an N type UG-1052/U receptacle jack.

e. 490 mc-1000 mc Antenna. Any antenna operating within a frequency range of 490 mc to 1000 mc, having an output impedance of 50 ohms, unbalanced. It must have an RG-55 coaxial cable with an N type UG-536A/U plug to connect to an N type UG-1052/U receptacle jack.

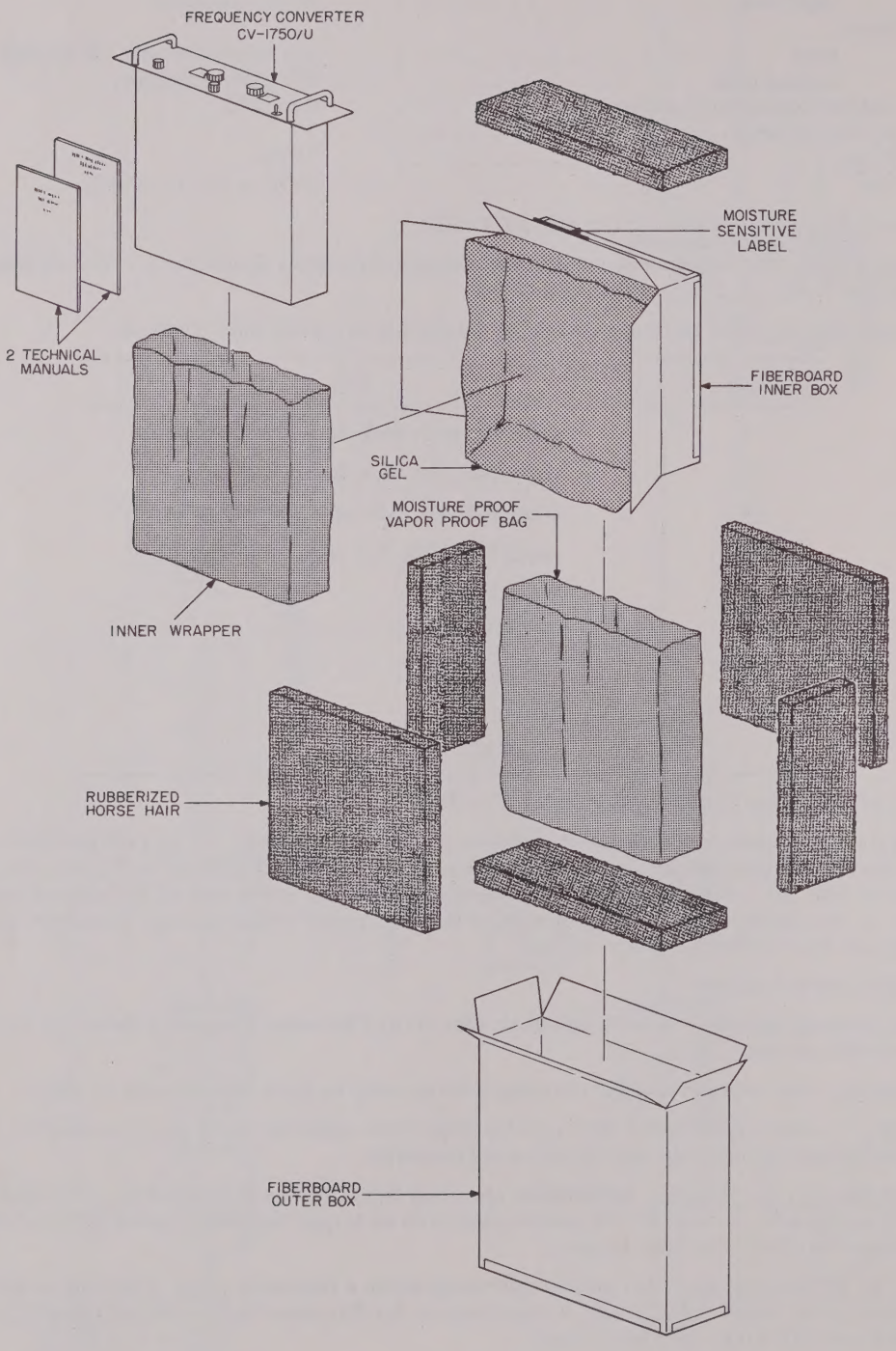


Figure 3. Packaging Diagram

CHAPTER 2

INSTALLATION

8. Unpacking

a. Packaging Data. When packaged for shipment, the Electronic Frequency Converter CV-1750/U is placed in a carton with an inner moistureproof-vaporproof container as shown in figure 3. The carton is 8.5 inches high by 24 inches long by 22 inches deep, and occupies 3.87 cubic feet with a weight of 20 pounds.

b. Removing Contents. The frequency converter is unpacked as follows:

(1) Open the outer fiberboard carton and remove the rubberized horsehair padding and the outer moistureproof-vaporproof bag.

(2) Open the outer moistureproof-vaporproof bag and open the inner fiberboard carton within it. Remove the inner wrapper.

(3) Open the inner wrapper and remove the two technical manuals and the frequency converter.

9. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage according to instructions previously described in paragraph 2.

b. See that the equipment is complete as listed in the table of components in paragraph 5.

10. Siting

The Electronic Frequency Converter CV-1750/U is designed to be mounted in a standard 19-inch relay rack indoors. The installation should be chosen so that it is convenient to transmission lines, power connections, and adequate lighting. Temperature control within the area should be capable of allowing the frequency converter to operate within its ambient temperature range.

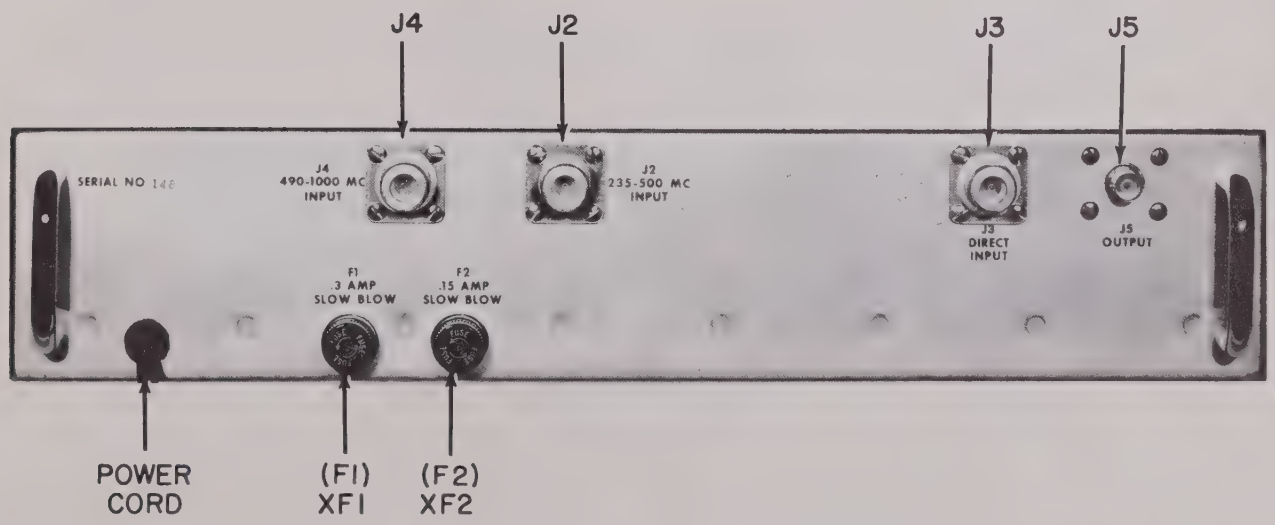


Figure 4. Electronic Frequency Converter CV-1750/U, Rear View

11. Installation

All components necessary to install the complete equipment are provided with the frequency converter. Insure that all tubes are firmly seated within their proper sockets. The tube locations are shown in figures 6 and 7. After replacing the covers, the equipment may now be rack mounted in a standard relay rack allowing 3.5 inches of vertical space and 14 inches depth in the rack.

12. Connections

All connections to the frequency converter are made in the rear of the equipment. Determine whether the supply voltage is 115 vac or 230 vac. Then set the slide switch on the chassis top (see figure 6) in the proper position. Plug the power cord into the voltage source; the third pin on the plug grounds the unit. If a three pin receptacle is not available, use the three-to-two pin adapter provided. When the adapter is used, the ground lead from the adapter must be connected to ground. Connect the coaxial cable from the high frequency (490 mc - 1000 mc) antenna to connector jack J4 490 - 1000 MC INPUT located on the rear of the equipment. Connect the coaxial cable from the low frequency (235 - 500 mc) antenna to connector jack J2 235 - 500 MC INPUT located on the rear of the equipment. Connect the coaxial cable from the antenna with operating frequencies below 235 mc to connector jack J3 DIRECT INPUT located on the rear of the equipment. Connect the cable from the 60-mc receiver input to connector jack J5 OUTPUT located on the rear of the equipment. The following is a list of cables required for operation of the frequency converter. Lengths of cables will vary dependent upon the specific location. These cables are not supplied with the equipment (see paragraph 7).

Cable No.	Cord	Required No.	From	Connects To
1		1	490 mc-1000 mc Antenna	Frequency Converter
2		1	235 mc-500 mc Antenna	Frequency Converter
3		1	Under 235 mc Antenna	Frequency Converter
4		1	Frequency Converter	Receiver

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. Operator's Controls and Indicators

13. Electronic Frequency Converter CV-1750/U, Controls and Indicators

Control or Indicator	Function
POWER ON switch	Turns power on and off.
Power lamp	Lights when power is applied to the equipment
Band selector, DIRECT, 235-500 MC, 490-1000 MC	In DIRECT position, receives signals below 235 mc. In 235-500 MC position, receives low frequency. In 490-1000 MC position, receives high frequency.
Low band tuning indicator	Graded dial from 235 to 500; dial lights when this range is selected.
High band tuning indicator	Graded dial from 490 to 1000; dial lights when this range is selected.
Low band tuner knob	Variable control used to tune from 235 mc to 500 mc.
High band tuner knob	Variable control used to tune from 490 mc to 1000 mc.
Fine tuning knob	Allows fine (vernier) tuning to the frequency converter.

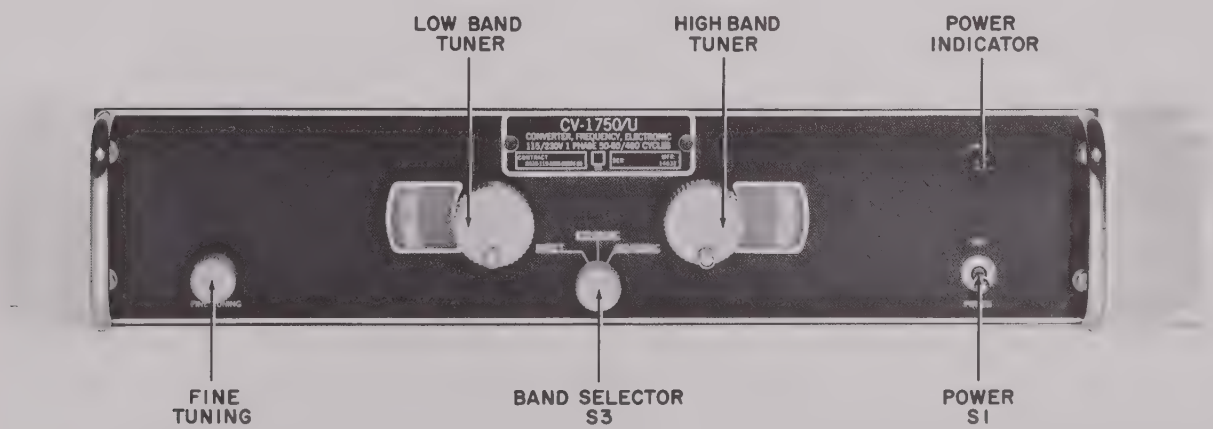


Figure 5. Operating Controls

Section II. Operation Under Usual Conditions

14. Starting Procedure

a. Preliminary. Set the band selector switch to the frequency band to be used; set the FINE TUNING control to mid-range.

b. Starting. Turn on the frequency converter by placing the power switch located on the right-hand side of the front panel to the ON position. The power lamp will light, and the low or high band indicator dial lamp will light if either the low or high band has been selected. If the direct position has been selected, only the power lamp will light.

15. Tuning Procedure

During reception of signals below 235 mc, tuning should be performed directly with the tuning controls of the receiver with which the frequency converter is being used. During reception of signals above 235 mc, the receiver must first be tuned to exactly 60 mc, and then additional tuning should be performed at the frequency converter with either the low band or high band tuning control. The fine tuning control should be used as necessary when tuning the frequency converter. This control has no effect when the band selector switch has selected a direct input.

16. Operating Procedures

Start the equipment as instructed in paragraph 14, and perform the following steps:

a. Set the band selector switch to the DIRECT, 235-500 MC, or 490-1000 MC position depending on the frequency of the signal to be received.

b. If the 235-500 MC or 490-1000 MC position is selected, carefully tune the associated receiver to exactly 60 mc.

c. Adjust the tuning knob on the frequency converter corresponding to the band selected for the desired frequency.

d. Adjust the FINE TUNING control on the frequency converter as necessary to make small corrections in tuning.

17. Stopping Procedure

When it is desired to stop operating the equipment, place the POWER switch in the OFF position.

CHAPTER 4

MAINTENANCE INSTRUCTIONS

Section I. Organizational Maintenance

CAUTION

The physical placement and lead length of components in the two tuners are extremely critical. When replacing any component in the tuners, the new part must duplicate the location and lead length of the original part. In addition, certain component locations are sufficiently critical to preclude their replacement at any maintenance level. These components are suitably indicated on the illustrations, schematic diagrams, and in the parts list.

18. Scope

This section contains instructions for organizational maintenance of Electronic Frequency Converter CV-1750/U. Organizational maintenance consists of replacement of defective fuses, preventive maintenance, visual inspection, trouble-shooting, and replacement of defective tubes.

19. Tools, Materials, and Test Equipment Required

The tools, materials, and test equipment required for unit repairman's maintenance are listed below.

a. Tools.

(1) Tool Equipment TK-105/G

(2) Six-pin tube puller

b. Materials.

(1) Solvent, dry-cleaning, per DA TB9-268 dtd 10 Nov. 1959

(2) Dry brush

(3) Cleaning cloth

c. Test Equipment

(1) Vacuum tube voltmeter, TS-505A/U

(2) Tube tester TV-2/U

20. Preventive Maintenance

Preventive maintenance is work performed on equipment to keep it in good working order so that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble-shooting and repair since its object is to prevent certain troubles from occurring. These operations should be performed at the intervals indicated, unless altered by the local commander.

a. General Maintenance Techniques

(1) Use a dry brush for cleaning. If necessary, except for electrical contacts, moisten the brush with a dry cleaning solvent, then wipe the parts dry.

WARNING

Cleaning compound may be flamable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

(2) If available, dry compressed air may be used at a line pressure not exceeding 60 psi to remove dust from inaccessible places, taking care to avoid any mechanical damage.

(3) Screws, bolts, and nuts should not be tightened carelessly. Fittings tightened beyond the pressure for which they are designed may be damaged or broken.

b. Maintenance Checks.

(1) Check the following items daily.

(a) Clean exterior of front panel.

(b) Check operation of front panel lamps DS1, DS2, and DS3.

(c) Check knobs and switches.

(2) Check the following items weekly. Disconnect all power and input and output connections before performing the following operations. Upon completion, reconnect power, input, and output connections and check for satisfactory operation.

(a) Remove the frequency converter from its rack mounting and clean the exterior of the chassis and all accessible parts.

(b) Remove the dust covers and inspect filter capacitors C1 and C2 for leakage, bulging, and indications of overheating.

(c) Inspect power transformer for excessive heating.

(d) Inspect fuses F1 and F2 and fuse holders for corrosion, cracks, and lack of sufficient tension to insure good contact.

(e) Replace the dust covers.

(3) Visually check the following items monthly, and tighten and clean if necessary.

(a) Inspect tube and crystal sockets and pins for loose contacts, dirt, and corrosion.

(b) Inspect terminals of capacitors C1 and C2 for corrosion.

(c) Inspect resistors for blistering, discoloration, or other evidence of overheating.

(d) Inspect switches S1, S2, and S5 and gear train assembly for dirt, corrosion, loose contacts, and unsatisfactory mechanical action.

(e) Inspect wires, cords, and cables for cracked or frayed insulation.

(f) Inspect terminal board TB1 for cracks, dirt, and loose connections.

(g) Inspect potentiometer R6 for unsatisfactory electrical and mechanical operation.

(h) Inspect mountings, machine screws, and nuts for tightness.

(i) Inspect all accessible terminals for loose connections and corrosion.

(j) Inspect transistor Q1 for loose connections.

(k) Inspect input and output connector cables for loose connections.

c. Performance Check. After completing the above preventive maintenance checks, check the equipment for normal performance as described in Chapter 3.

21. Trouble-Shooting

The trouble-shooting and repair work that can be performed at the organizational maintenance level is necessarily limited by the tools, test equipment, and replaceable parts issued. Trouble-shooting is based on the performance of the equipment in determining such troubles as burned-out tubes or fuses. Before trouble-shooting the frequency converter, insure that the trouble is not in an antenna or in the associated receiver.

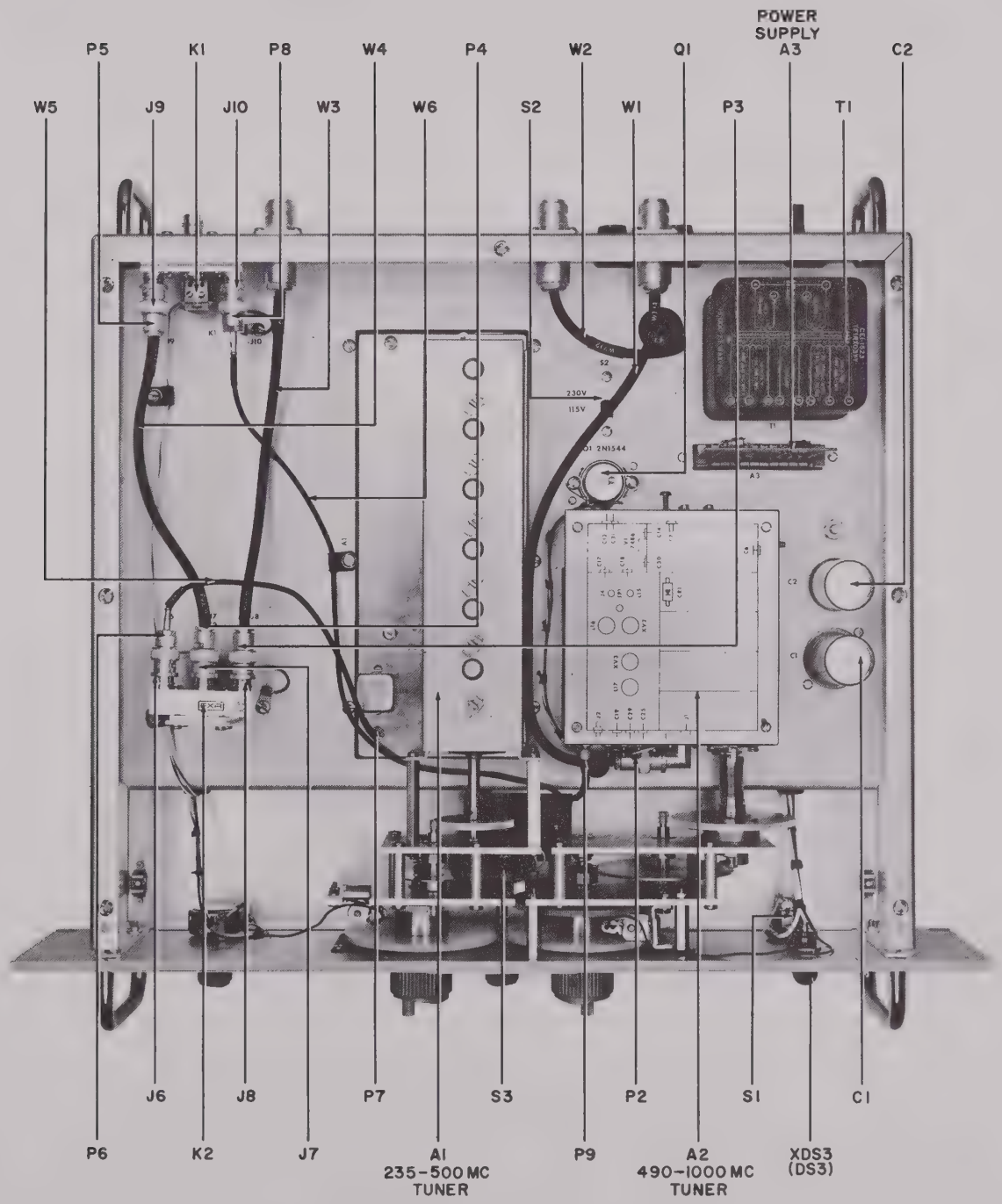


Figure 6. Top View, Location of Components

22. Visual Inspection

When failure is encountered, and the cause is not immediately apparent, check as many of the following items as is practical before starting a detailed examination of the component parts. Whenever possible, obtain information directly from the operator of the equipment regarding performance at the time trouble occurred. Failure of the frequency converter to operate properly will usually be caused by one or more of the following faults:

a. Worn, broken, or disconnected cables and plugs.

b. Burned-out fuses.

c. Defective tubes.

23. Equipment Performance Checklist

a. General. The equipment performance check list is a procedure to systematically check equipment performance. All corrective measures which the unit repairman can perform are given in the Corrective Measures column. When using the check list, start at the beginning and follow each step in order. If the corrective measures indicated do not fix the equipment, trouble-shooting is required by a higher echelon. Note on the repair tag how the equipment performed and what corrective measures were taken.

b. Procedure. Place the equipment in operation. Allow the equipment to warm up for several minutes. Operate the equipment as shown in the check list below.

c. Equipment Performance Check List.

	Step	Action	Normal Indication	Corrective Measure
PREPARATORY	1	Connect input cable from antenna less than 235 mc to J3 DIRECT INPUT.		
	2	Connect input cable from 235 mc-500 mc antenna to J2 235- 500 MC INPUT.		
	3	Connect input cable from 490 mc-1000 mc antenna to J4 490- 1000 MC INPUT		
	4	Connect output cable from 60 mc receiver to J5 OUTPUT.		
	5	Set band selector switch to DIRECT, 235 - 500 MC, or 490-1000 MC for antenna to be used.		
	6	Turn POWER-ON switch to ON position.	Power indicator lamp lights, and frequency dial indicator lamp lights if low or high band antennas have been selected.	Check fuses, power cord, and cable connections at rear of unit.

	Step	Action	Normal Indication	Corrective Measure
EQUIPMENT PERFORMANCE	7	Set band selector switch to DIRECT.	Signals may be received using receiver tuning controls.	Check K1, K2
	8	Set band selector switch at 235 - 500 MC and adjust tuning knob and FINE TUNING control on frequency converter.	With receiver tuned to 60 mc, signals may be received through the frequency converter.	Check K1, K2, A1V1 thru A1V4.
	9	Set band selector switch at 490 - 1000 MC and adjust tuning knob and FINE TUNING control on frequency converter.	With receiver tuned to 60 mc, signals may be received through the frequency converter.	Check K1, K2 A2V1 thru A2V3
STOP	10	Turn POWER-ON switch to off position.	Dial and power indicator lamps go out.	Check for faulty power switch.

24. Tube Testing and Techniques

a. When trouble occurs, check all cabling and connections before removing any tubes. Isolate the trouble to the high band or low band tuner. If tube failure is suspected, check the tubes as described below. The tube locations are shown in figures 6 and 7.

CAUTION

Do not rock or rotate a tube when removing it from a socket; pull it straight out with a tube puller.

b. If a tube tester is to be used, remove and test one tube at a time. Discard a tube only if its defect is obvious or if the tube tester shows it to be defective. Do not discard a tube that tests at or near its minimum test limit on the tube tester. Put back the origianl tube, or insert a new one if required, before testing the next one.

c. If a tube tester is not available, the following chart provides voltage and resistance readings for a VTVM, using 115 vac line voltage. All tubes in the low band tuner (A1) are measured with the band selector switch in the 235-500 MC position. All tubes in the high band tuner (A2) are measured with the band selector switch in the 490-1000 MC position, and, unless otherwise specified, all voltages are positive dc with respect to ground.

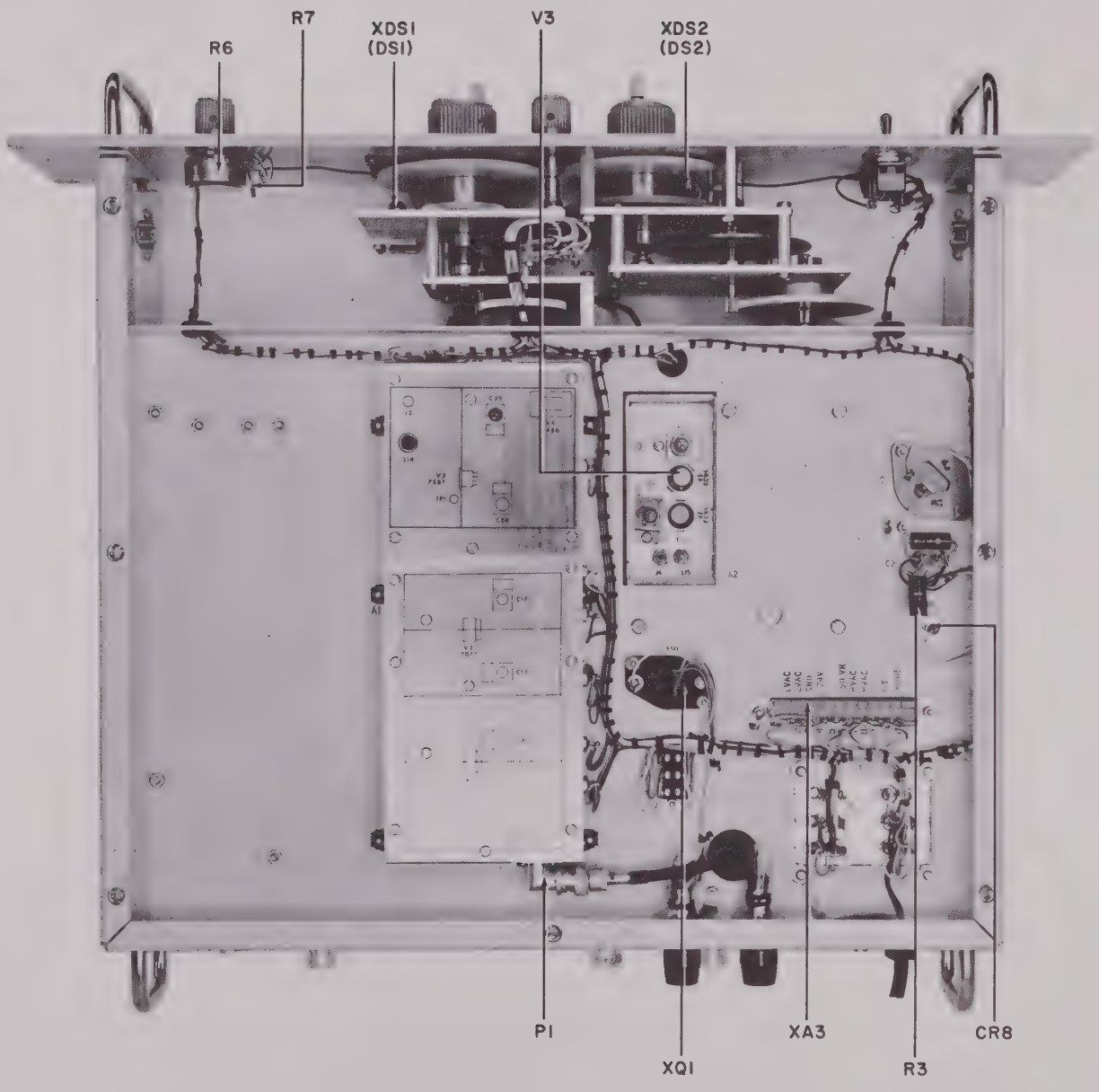


Figure 7. Bottom View, Location of Components

Voltage Readings

Tube	Type	Pin Numbers					
		2	4 Grid	8 Cathode	10 Heater	12 Heater	Plate
A1V1	7077	--	0	0.5	0	6.3 vac	120
A1V2	7077	--	0	0.5	0	6.3 vac	120
A1V3	7587	16	-2.5 (with 1 meg series resistor)	0	6.3 vac	0	140
A1V4	7486	--	-4.5 (with 1 meg series resistor)	0	0	-6.0	90 (with 1 meg series resistor)
A2V1	7486	--	Do not measure.	0	0	-6.0	85
A2V2	6CW4	75	0	0.4	0	6.3 vac	--
A2V3	6CW4	140	68	75	0	6.3 vac	--

Resistance Readings

A1V1	7077	--	0	1K	0	0.3	200K
A1V2	7077	--	0	1K	0	0.3	200K
A1V3	7587	670K	940K	0	0.3	0	200K
A1V4	7486	--	10K	0	0	2	200K
A2V1	7486	--	5.6K	0	0	2	200K
A2V2	6CW4	inf.	47K	68	0	0.3	--
A2V3	6CW4	200K	inf.	inf.	0	0.3	--

25. Removal and Replacement of Lamps

a. Power Indicator. The power indicator lamp may be removed by unscrewing the lampholder located in the right side of the front panel. It may be replaced by inserting a new type GE 345 6.3v, 0.04 amp lamp.

b. Dial Indicators. Both dial indicator lamps may be removed by unscrewing them from their clips mounted on the gear train assembly. They may be replaced by screwing a GE 47 6.3v, 0.15 amp lamp in their place.

26. Power Supply Module

The power supply module should first be checked to insure that all pins are properly seated in position. Voltage and resistance readings for the power supply module are made with VTVM using 115 vac line voltage and are listed in the chart below.

Power Supply Voltage and Resistance

Pin Number	1	2	3	4	5	6	7	8	9	10	11
Voltage	14 vac	14 vac	0	-21 vdc	-12 vdc	150 vdc	165 vac	165 vac	-6.1 vdc	75 vac	200 vdc
Resistance (ohms)	4	4	0	135	33	200K	200	200	35	100K	200K

Section II. Field and Depot Maintenance

WARNING

When servicing the frequency converter, be extremely careful because of the high voltages exposed. Always disconnect the power cord before doing any testing. With the high voltage off, large potentials may still be present. Before touching any part after the voltage is shut off, short that part to ground.

27. Trouble-Shooting Procedures

The first step in servicing a defective frequency converter is to localize the fault. Localization means tracing the fault to the defective part responsible for the abnormal operation of the set. Some faults, such as burned-out resistors and shorted transformers, can often be located by sight and smell. The majority of faults, however, must be localized by checking voltage and resistance.

a. Component Location. The tests listed below will aid in isolating the source of trouble. To be effective, the procedure should be followed in the order given. Remember that the servicing procedure should cause no further damage to the equipment. First the trouble should be localized to a single stage or circuit. Then, the trouble may be isolated within that stage or circuit by appropriate voltage and resistance measurements. The service procedure is summarized as follows:

(1) Visual inspection. Through the visual inspection alone, the repairman may frequency discover the trouble, or determine the stage in which the trouble exists. This inspection is valuable in avoiding additional damage to the frequency converter which might occur through improper servicing methods and in forestalling future failures.

(2) Operational test. The operational test, paragraph 29, is important because it frequently indicates the general location of trouble. In many instances the information gained will determine the exact nature of the fault. In order to utilize this information fully, all symptoms must be interpreted in relation to one another.

(3) Trouble-Shooting chart. The trouble symptoms listed in this chart will aid greatly in localizing trouble.

(4) Signal substitution. The principle advantage of the signal substitution method, paragraph 32, is that it usually enables the repairman to localize a trouble accurately and quickly to a given stage when the general location of the trouble is not immediately evident from the above tests.

(5) Intermittents. In all these tests the possibility of intermittents should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. It is possible that the trouble is not in the equipment itself, but in the installation (mounting, other equipment in the system), or the trouble may be due to external conditions. In this event, test the complete installation.

b. General Precautions. Whenever the frequency converter is serviced, observe the following precautions very carefully.

(1) Before a part is unsoldered, note the position of the leads. If the part, such as a transformer, has a number of connections, tag each of the leads to it.

(2) Be careful not to damage other leads by pulling or pushing them out of the way.

(3) Do not allow drops of solder to fall into the set, since they may cause short circuits.

(4) A carelessly soldered connection may create a new fault. It is very important to make well-soldered joints, since a poorly soldered joint is one of the most difficult faults to find.

(5) When a part is replaced in r-f or i-f circuits, it must be placed exactly as the original one was. A part which has the same electrical value but different physical size may cause trouble in high frequency circuits. Give particular attention to proper grounding when replacing a part. Use the same ground as in the original wiring. Failure to observe these precautions may result in decreased gain or oscillation of the circuit.

28. Test Equipment Required for Trouble-Shooting

The test equipment (or equivalent) required for trouble-shooting Electronic Frequency Converter CV-1750/U is listed below.

Test Equipment	Model
Signal Generator	AN/URM-25
Signal Generator	AN/USM-44
Signal Generator	AN/URM-49
Sweep Generator	Telonic HD-1A
Tube Tester	TV-2/U
Oscilloscope	OS-46/U or AN/USM-50A
Multimeter	TS-352/U
VTVM	TS-505A/U

29. Operational Tests

If the frequency converter is connected to its associated system equipment as in normal operation, operate the frequency converter as described in the equipment performance check list in paragraph 23 because it frequently indicates the general location of trouble. Check the equipment for smoke and the odor of burned or overheated parts.

30. Trouble-Shooting Chart

The following chart is supplied as an aid in locating trouble in the frequency converter. This chart lists the symptoms which the repairman observes while making a few simple tests. The signal substitution tests outlined in paragraph 32 can then be used to supplement this procedure and to determine the defective stage. Once the trouble has been localized to a stage or circuit, a tube check, and voltage resistance measurements of this stage or circuit should ordinarily be sufficient to isolate the defective part. Normal voltage and resistance measurements for tubes are given in paragraph 24. Component locations are shown in figures 4 through 10. A wiring diagram for the unit is presented in Figure 20.

Item	Indication	Probable trouble	Procedure
1	POWER-ON switch (S1) in ON position. Equipment fails to operate and indicator lamps do not light.	Equipment not properly connected to 115 vac or 230 vac external power source.	Check power cord and line voltage.
		Open fuse F1 or F2.	Check and replace fuse if necessary. Check positioning of switch (S2) for 115 vac or 230 vac as applicable.
		Connecting leads to fuse holder(s) broken.	Repair leads.
		Power and dial lamps defective.	Check lamps and leads. Replace or repair if necessary.
		Power switch (S1) defective.	Replace power switch or repair leads if necessary.
		Defective transistor Q1.	Using a VTVM, check the emitter for -6.0 vdc and 2 ohms, the base for -6.1 vdc, and the collector for -12 vdc. Do not measure resistance values for the base and the collector. Replace Q1 if defective.
		Poorly connected power supply module (A3).	Check pins on plug-in card for proper seating.
		Defective electronic components.	Check terminals of transformer, with a voltmeter, for values printed on transformer cover.

Item	Indication	Probable trouble	Procedure
			Check values of components shown on power supply module schematic diagram, figure 16. Replace defective components.
2	Band selector switch (S3) on 235-500 MC position. Equipment fails to operate.	Equipment not properly connected to external antenna (J2) or 60 mc receiver (J5).	Check connections at rear of equipment. Check coaxial cables to connector jacks J2 and J5.
		Defective band selector switch (S3).	Replace band selector switch or repair leads if necessary.
		Tuning dial not aligned to tuner shaft.	Realign tuning dial as described in paragraph 34.
		Defective vacuum tubes.	Check voltage and resistance of tubes A1V1, A1V2, A1V3, and A1V4 with a VTVM for values shown in paragraph 24.
		Defective electronic components.	Check values of electronic components shown on low band tuner schematic diagram, figure 17. Replace defective components.
		Low band tuner out of alignment.	Realign tuner as described in paragraph 36.1.
3	Band selector switch (S3) on 490-1000 MC position. Equipment fails to operate.	Equipment not properly connected to external antenna (J4) or 60 mc receiver (J5).	Check connections at rear of equipment. Check coaxial cables to connector jacks J4 and J5.
		Defective band selector switch (S3).	Replace band selector switch or repair leads if necessary.

Item	Indication	Probable trouble	Procedure
		Tuning dial not aligned to tuner shaft.	Realign tuning dial as described in paragraph 34.
		Defective vacuum tubes.	Check voltage and resistance of tubes A2V1, A2V2, and A2V3 with a VTVM for values shown in paragraph 24.
		Defective electronic components.	Check values of electronic components shown on high band tuner schematic diagram, figure 18. Replace defective components.
		High band tuner out of alignment.	Realign tuner as described in paragraph 36.2.
4	Band selector switch (S3) on DIRECT position. Equipment fails to operate.	Equipment not properly connected to external antenna (J3) or 60 mc receiver (J5).	Check connections at rear of equipment. Check coaxial cables to connector jacks J3 and J5.
		Defective band selector switch (S3).	Replace band selector switch or repair leads if necessary.
		Defective coaxial relays.	Check K1 and K2.
5	No change in frequency when using FINE TUNING control.	Defective FINE TUNING control.	Replace FINE TUNING potentiometer or repair leads if necessary.

31. Signal Substitution Notes

a. Signal substitution requires a source of i-f and r-f signals.

b. A voltmeter, milliammeter, and tube tester are also needed to isolate the defective part after the faulty stage has been indicated by signal substitution.

c. In the tests indicated in paragraph 32, ground one side of the signal generator to the frequency converter chassis and connect the other side through a 0.05 μf capacitor to the frequency converter point as directed.

d. When working back from the output to the input stages, decrease the output of the signal generator as much as possible. If possible, compare with a frequency converter known to be in good condition.

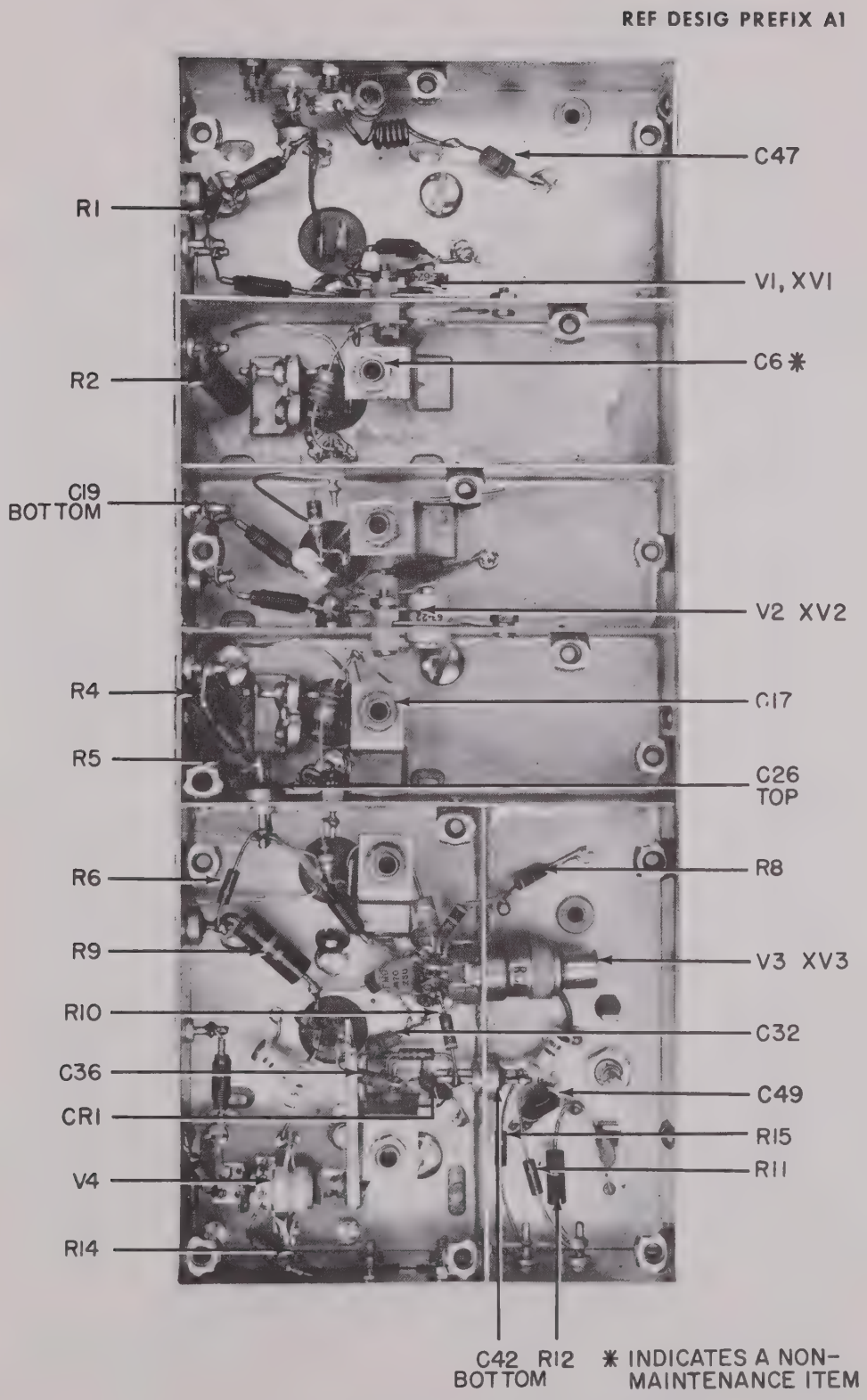


Figure 8. 235-500 mc Tuner, Component Locations, Sheet 1

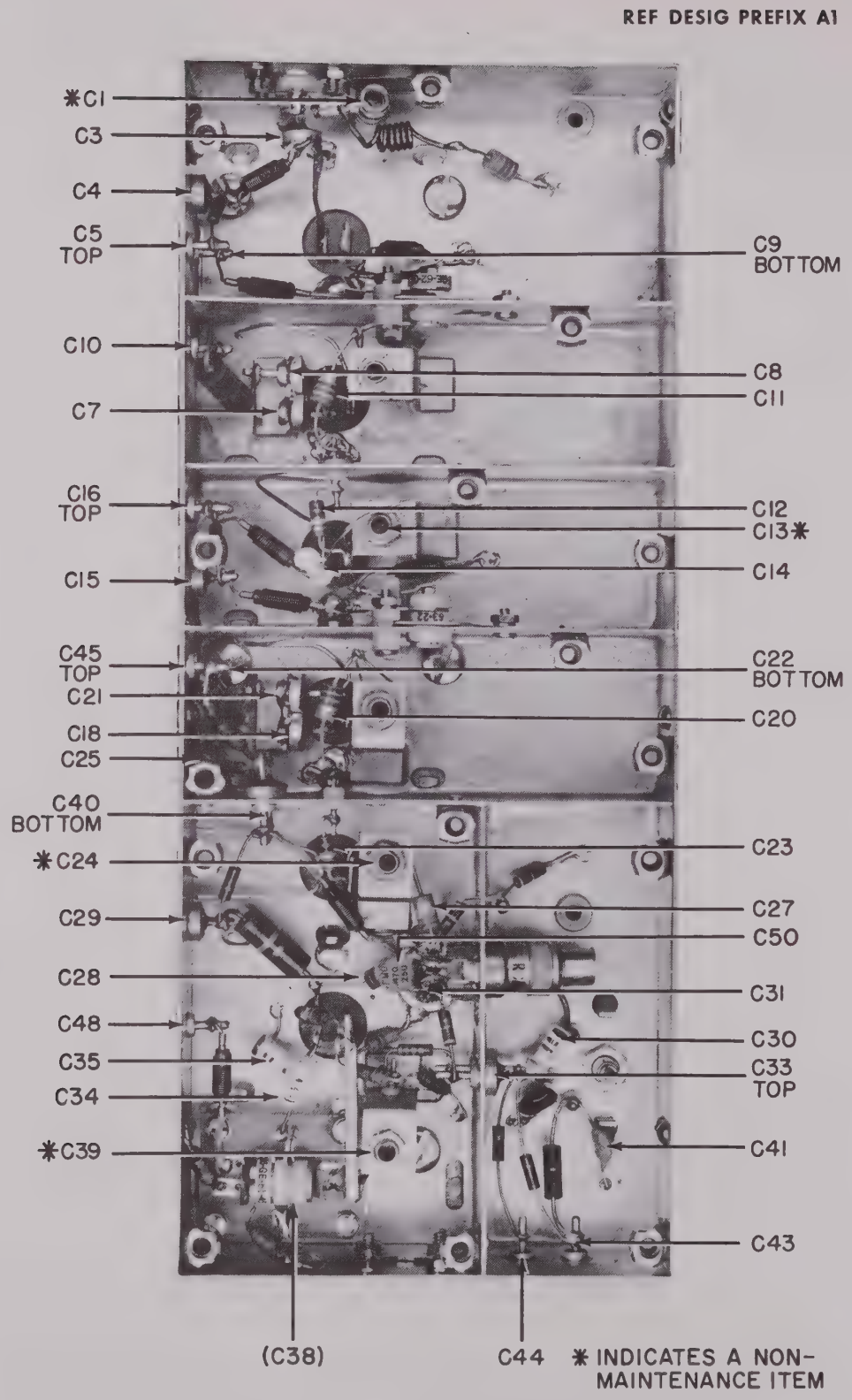
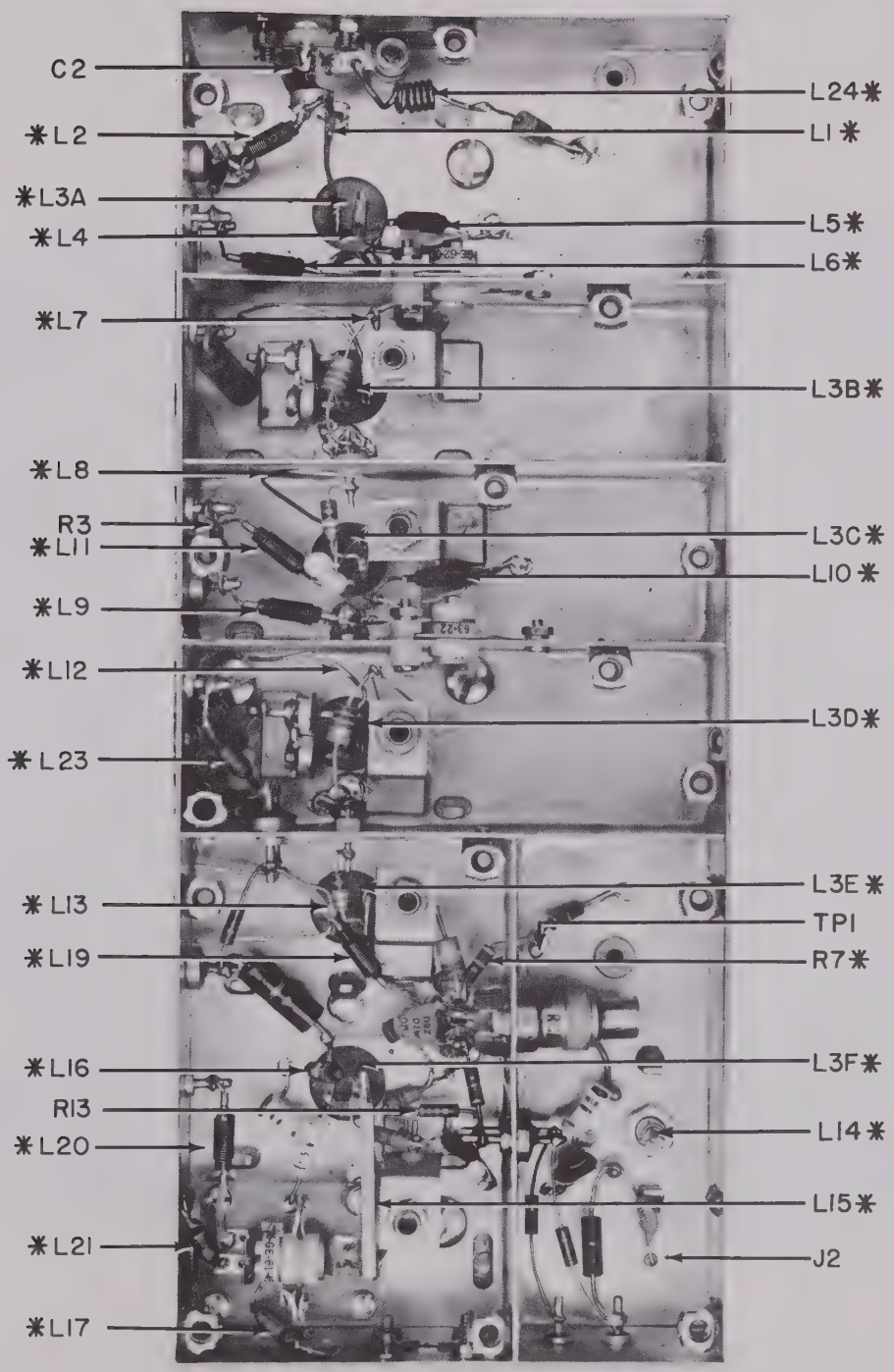


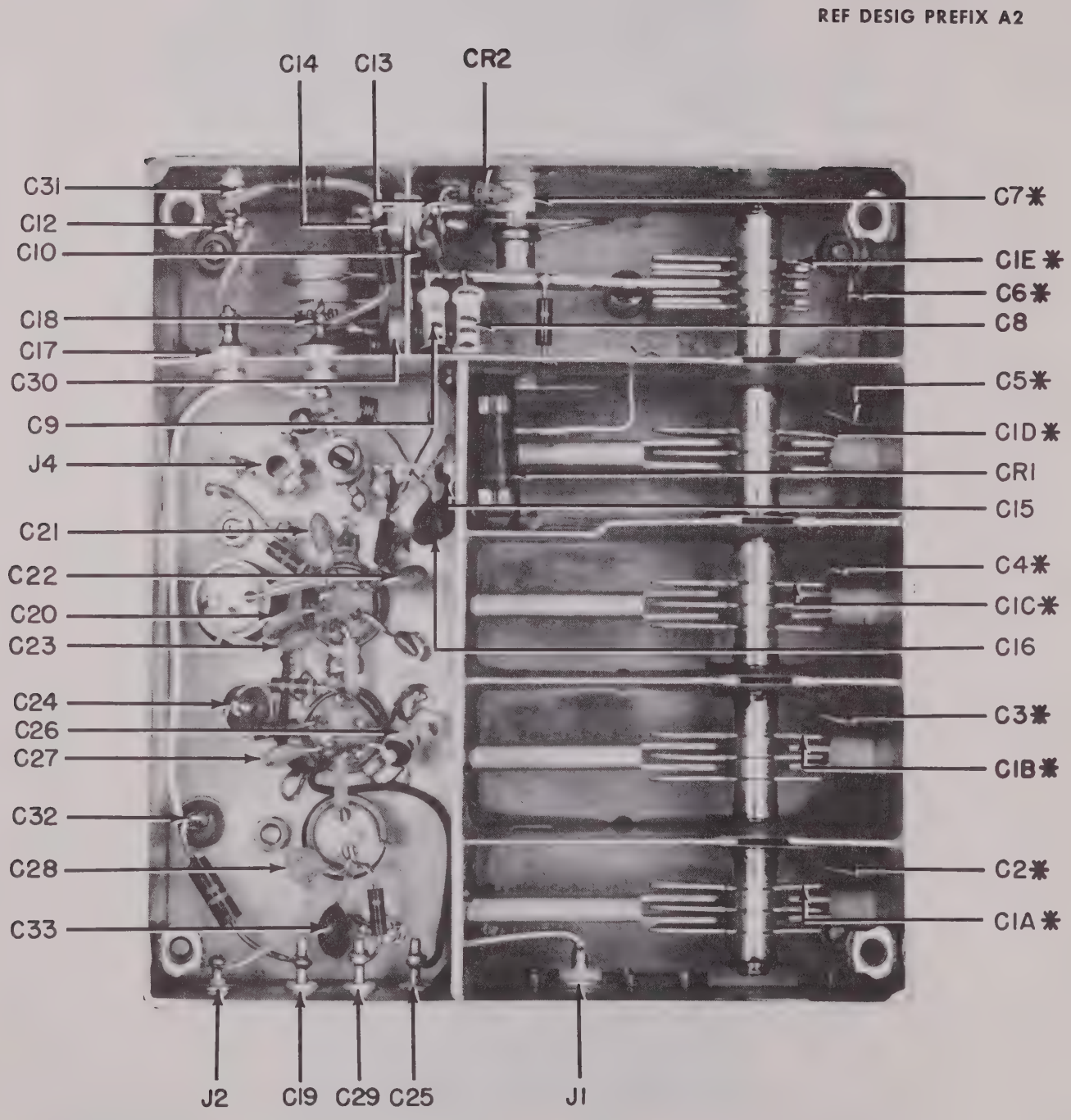
Figure 8. 235-500 mc Tuner, Component Locations, Sheet 2

REF DESIG PREFIX A1



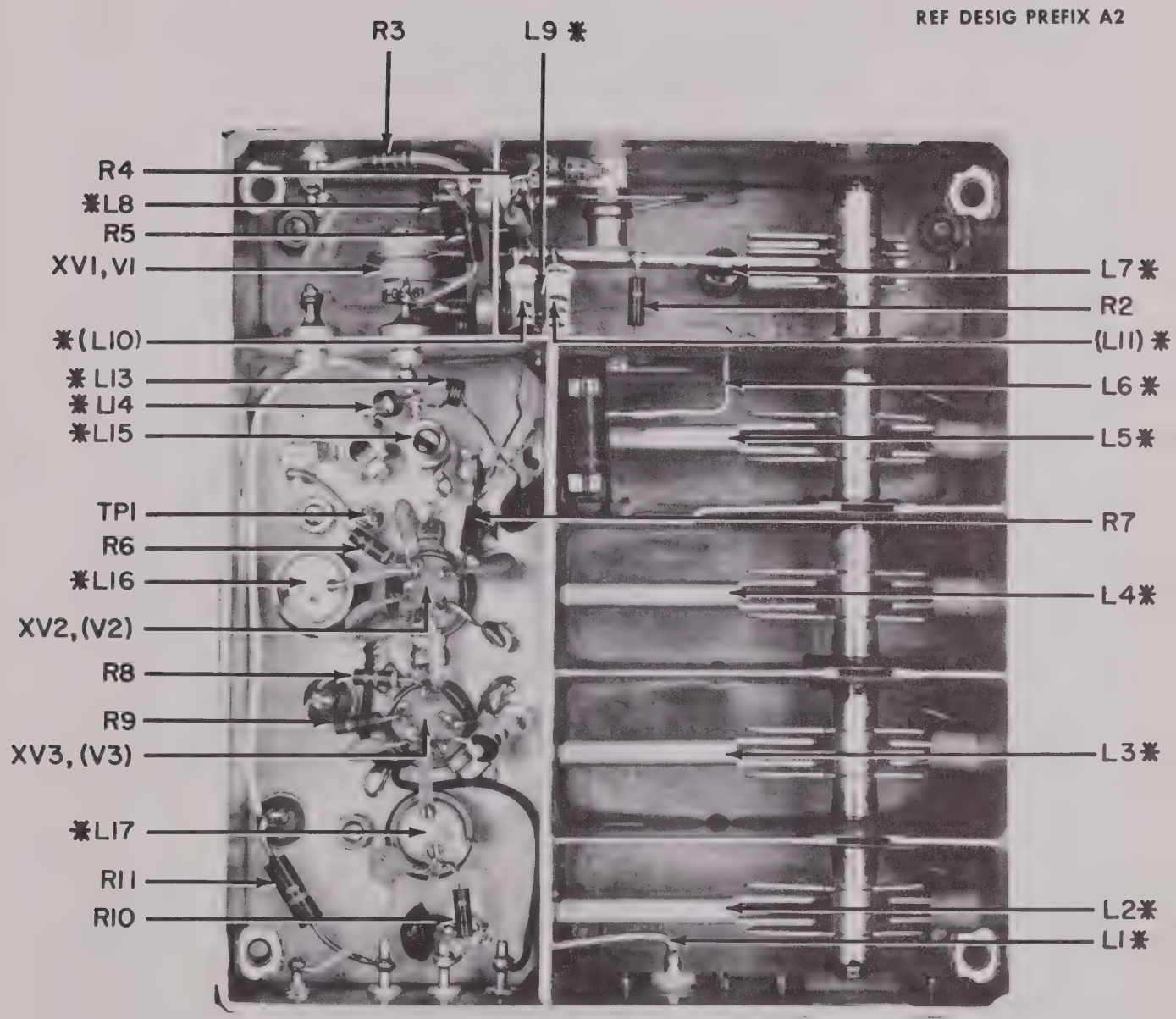
* INDICATES A NON-MAINTENANCE ITEM

Figure 8. 235-500 mc Tuner, Component Locations, Sheet 3



* INDICATES A NON-MAINTENANCE ITEM.

Figure 9. 490-1000 mc Tuner, Component Locations, Sheet 1



✱ INDICATES A NON-MAINTENANCE ITEM.

Figure 9. 490-1000 mc Tuner, Component Locations, Sheet 2

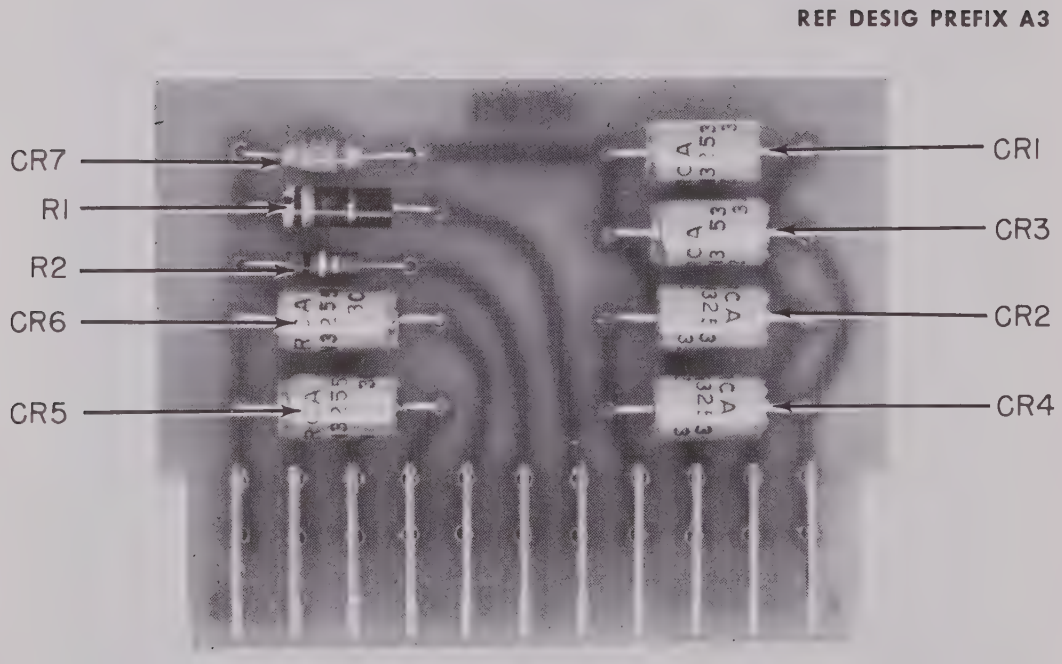


Figure 10. Power Supply Module, Component Locations

e. Check the wiring and soldering in each stage during this procedure.

CAUTION

Do not remove the shield can of the high or low band tuner until the trouble has been traced to that particular unit. Do not damage the wiring by pushing it back and forth during inspection. Be careful not to damage the frequency converter in any way.

f. Misalignment of one or more stages of the frequency converter will cause reduced output. If the local oscillator in either tuner is misaligned, the associated tuning dial will read erroneously.

g. When trouble is localized in a given stage, first test the tube if such a test is indicated; then measure the voltage; and finally measure the resistance at the tube socket of that stage.

h. Trouble in a circuit or stage may not cause changes in voltage and resistance measurements at the tube socket. The instructions included in this paragraph are merely a guide and should suggest other procedures, such as voltage and resistance measurements on individual components.

i. Remove only one tube at a time when testing. Check the number of the tube, test the tube, and if it is not defective, return it to its proper socket before another tube is removed.

j. At each step it is assumed that all previous steps were completed satisfactorily. Isolate and clear any trouble located before proceeding with any succeeding steps.

32. Signal Substitution

Set the test equipment as shown in Figure 11 and observe the following procedures.

a. Set the signal generator output to 60 mc at a level of -80 dbm (22 μv).

b. Tune the receiver to the signal generator using the manual gain control mode.

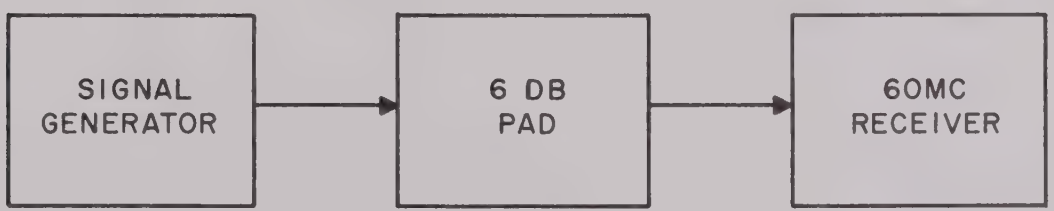


Figure 11. Test Equipment Setup, Signal Substitution Test

c. Adjust the gain of the receiver until the signal strength meter reads at a convenient mid-scale reference. If the receiver is not equipped with a signal strength meter, connect a VTVM across the AM detector load resistor and adjust the VTVM controls and the gain of the receiver for a convenient mid-scale reading. Do not disturb these settings during any subsequent steps.

d. Connect the output of the Electronic Frequency Converter CV-1750/U to the input of the 6 db pad, and connect the output of the signal generator to the input of the frequency converter as shown in Figure 12.

e. Adjust the signal generator to frequencies of 250 mc, 375 mc, and 500 mc on the low band tuner of the frequency converter. For each frequency, note the signal generator output level necessary to produce the same receiver signal strength meter reference obtained in step c. above. Subtract -80 dbm from these levels to obtain the gain of the frequency converter. The gain across the low band range shall be 18 db to 30 db.

f. Connect the signal generator to the high band tuner input and make similar measurements at 500 mc, 750 mc, and 1000 mc. The gain across the high band range shall be 20 db to 32 db.

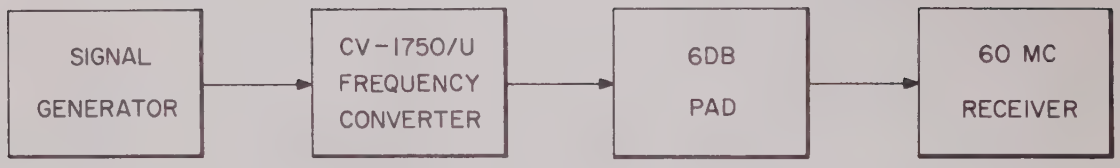


Figure 12. Equipment Setup, Gain Measurement

Section III. Repairs and Alignment

33. General Parts Replacement Techniques

All parts in Electronic Frequency Converter CV-1750/U are readily accessible and are easily replaced if found to be faulty. The electrical components are shown in figures 4 through 10. When a switch requires replacement, mark the switch carefully with tags when numerous wires are involved to avoid an incorrest installation of the new switch. Duplicate the position of all electronic components in the high and low band tuners. The physical placement and lead length of certain components are sufficiently critical to preclude maintenance at any level. These components are noted on the illustrations, schematic diagrams, and in the Illustrated Table of Parts.

34. Adjustment of Tuning Dial Stops

The gear train mechanisms use friction drive and rely on the stops of the inductuner to halt the turning in the case of the 235-500 mc r-f tuner and on stops mounted on the gear train to halt the turning in the case of the 490-1000 mc r-f tuner. An exploded view of the gear train assembly is shown in figure 15. The tuning dials are rigidly attached to their shafts and are geared to the tuners in a manner such as to make it quite unlikely they will ever get out of position. However, if it becomes necessary to mechanically realign either dial, follow the steps outlined below.

a. 235-500 mc r-f Tuner.

(1) Release the Allen head setscrews on each side of the coupling between the gear train shaft and the inductuner shaft.

(2) Rotate the inductuner shaft to maximum clockwise position.

(3) Turn the dial until the hairline is at the mark above 500.

(4) Tighten the coupling between the gear train and the inductuner shaft.

(5) Check the operation by turning crank counterclockwise until the inductuner no longer turns. The dial should read at the fifth mark beyond 235 mc.

b. 490-1000 mc r-f Tuner.

(1) Release the Allen head setscrews on each side of the coupling between the gear train shaft and the r-f tuner shaft.

(2) Rotate the r-f tuner shaft to maximum counterclockwise position.

(3) Turn the dial until the hairline is at the mark below 490. The gear train should be stopped at the low end gear train stop at this point.

(4) Tighten the coupling between the gear train and the r-f tuner shaft.

(5) Check the operation by turning the tuning crank clockwise until the r-f tuner shaft no longer turns. The dial should read between 1000 and the mark beyond 1000.

35. Test Equipment and Special Tools Required for Alignment

The following is a chart of test equipment and special tools required for the alignment of Frequency

Converter CV-1750/U. Equivalent equipment may be substituted for any item listed.

Test Equipment	Model
Oscilloscope	OS-46/U or AN/USM-50A
VTVM	TS-505/U
Signal Generator	AN/URM-25
Sweep Generator	Telonic HD-1A
Signal Generator	AN/USM-44
Signal Generator	AN/URM-49
Radio Receiver	R-1279/URR

36. Alignment Instructions

The alignment procedures in this book are suitable for performance in the field when making periodic performance checks, or when making adjustments after replacing tubes or components. Only those controls specifically referred to within a series of steps given for aligning a particular circuit affect the work in that circuit. Those controls not mentioned in any one series of steps may be left in any position. The alignment of this unit should be performed only with suitable equipment by technicians thoroughly familiar with their use. If the limits and tolerances specified in the following steps cannot be obtained during a field alignment, the equipment must be returned to the depot. Allow several minutes for warm-up before beginning to work.

a. Use of Marker During Alignment. A post-detection type of marker adder is recommended. However, if such a marker adder is not available, the marker generator output should be loosely coupled to the sweep generator output. This can be done by connecting the marker signal source to a turn or two of insulated wire wrapped around the sweep generator lead near the point of connection to the circuit under test, or by coupling to the sweep generator lead through a small capacitor. To insure that the addition of the marker is not affecting the response curve, disconnect the marker generator and observe that no change in the curve's shape or symmetry occurs.

b. Use of Oscilloscope During Alignment. The vertical and horizontal amplifier inputs on the oscilloscope should be set in the dc coupled mode. The dc component of the signal on the vertical input should be cancelled out by applying an equal voltage to the unused vertical differential scope input, since the dc component sometimes makes it impossible to center the signal vertically. Otherwise it will sometimes be necessary to use the ac coupled mode. A low-capacity shielded cable should be used to connect to the oscilloscope, and the shield should be grounded as closely as possible to the point to which the center conductor is connected.

36.1 235-500 mc Tuner Alignment

Alignment of the r-f tuner should be necessary only after replacement of a tube or component. A factory alignment is necessary if satisfactory responses cannot be obtained in the field using only those adjustments directly associated with the replaced tube or component. Low band tuner component locations are shown in figure 8.

a. Initial Settings. Make the following initial settings:

(1) Set the bandswitch to the 235-500 MC position.

(2) Set the FINE TUNING control to mid-range.

b. R-f Circuit Alignment. Proceed as follows:

(1) Remove the larger of the two bottom covers from the 235-500 mc tuner.

(2) Set up the equipment as shown in figure 13.

(3) Set the frequency converter tuning dial to 500 MC and the sweep generator to 500 mc.

(4) Set the oscilloscope vertical sensitivity to 50 millivolts per centimeter.

(5) Adjust the sweep generator sweep width and oscilloscope horizontal sensitivity until a response curve is displayed on the oscilloscope screen.

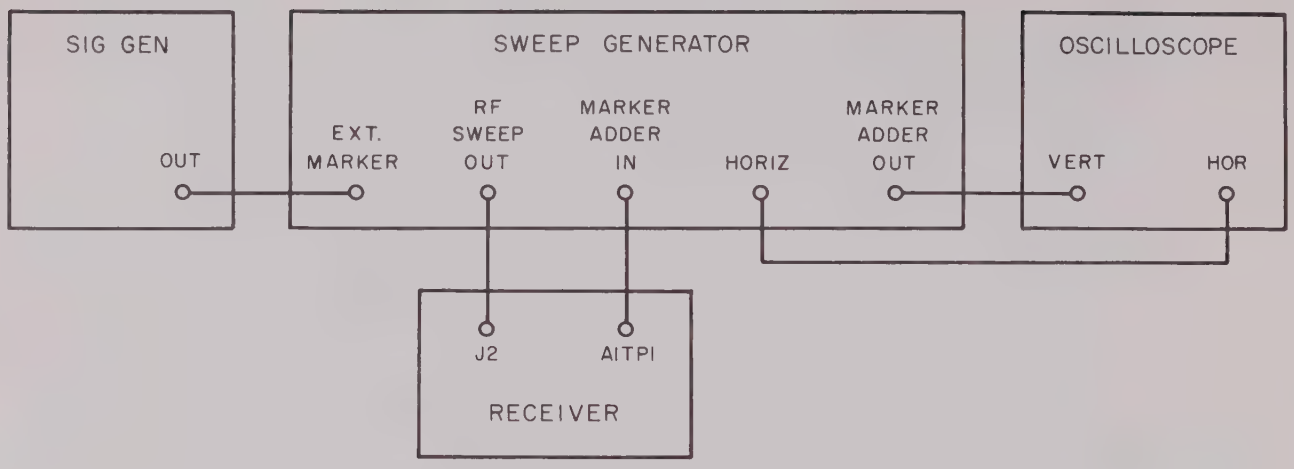


Figure 13. Equipment Setup, Tuner Alignment

(6) If A1V1 or any associated components are replaced, adjust A1C6 for maximum amplitude of a single-peak response. The response should be centered at exactly 500 mc. Typical response curves are shown in figure 14.

(7) If A1V2 or any associated components are replaced, adjust A1C13 and A1C17 for maximum amplitude of a single-peak response. The response should be centered at exactly 500 mc.

(8) If A1V3 or any associated components are replaced, adjust A1C24 for a single-peak response. The response should be centered at exactly 500 mc.

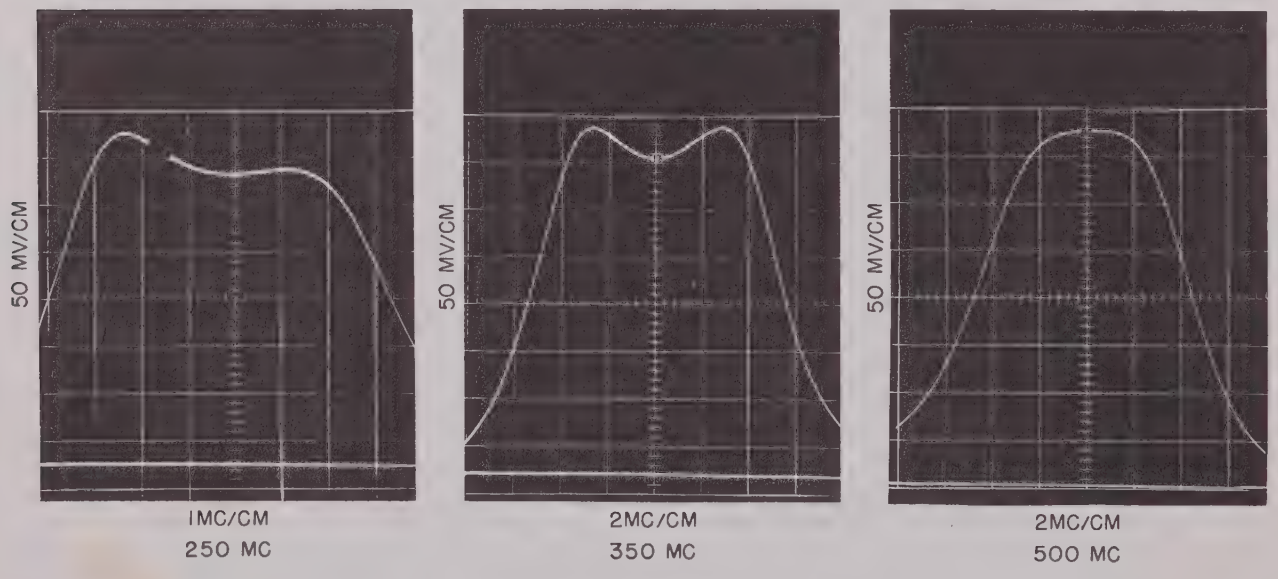


Figure 14. Typical Waveforms, Low Band Tuner Alignment

(9) Check the response at 250 mc and 350 mc. The response shape will vary slightly. The markers should be near the peak of the response curve.

(10) Replace the bottom cover.

c. Local Oscillator Alignment. Proceed as follows:

(1) Tune the receiver to exactly 60 MC, using the AN/USM-44 signal generator as a calibrating signal source.

(2) Connect the output of the frequency converter, J5, to the antenna input of the receiver.

(3) Connect the output of the AN/URM-49 signal generator to J2, 235-500 MC RF INPUT, located in the rear of the frequency converter.

(4) Adjust the signal generator to 500 mc.

(5) Adjust the signal generator output to 100 μv.

(6) Tune the frequency converter to the signal generator frequency using the receiver tuning meter to indicate proper tuning.

(7) The frequency converter tuning dial should indicate 500 mc, ± 1%.

(8) Repeat steps (2) through (5) for 350 mc. (Use the AN/USM-44 signal generator).

(9) Repeat steps (2) through (5) for 250 mc. (Use the AN/USM-44 signal generator).

(10) If any of the tuning dial indications exceed the ±1% tolerance, adjust C39. After any adjustment of C39, repeat steps (2) through (7).

d. 60 mc Mixer Adjustment.

(1) Repeat c. steps (1) through (6).

(2) Adjust the manual gain of the receiver for approximately one-half scale reading on the signal strength meter. (see par. 32).

(3) Adjust L14 for maximum reading on the receiver signal strength meter.

36.2 490-1000 MC R-F Tuner Alignment

Alignment of the tuner should be necessary only after replacement of a tube or component. Factory alignment is necessary if satisfactory responses cannot be obtained in the field using only those adjustments directly associated with the replaced tube or component. High band tuner component locations are shown in figure 9.

a. Initial Settings. Make the following initial settings:

(1) Set the bandswitch to the 490-1000 MC position

(2) Set the FINE TUNING control to mid-range.

b. R-f Circuit Alignment. The tunable r-f filter is factory aligned and in no case should a field alignment be attempted.

c. Local Oscillator Alignment. Proceed as follows:

(1) Tune the receiver to exactly 60 mc, using the AN/USM-44 signal generator as a calibrating signal source.

(2) Connect the output of the frequency converter, J5, to the antenna input of the receiver.

(3) Connect the output of the AN/URM-49 signal generator to J1, 490-1000 MC R-F INPUT.

(4) Adjust the signal generator to 1000 mc.

(5) Adjust the signal generator output to 100 μv.

(6) Tune the receiver to the signal generator frequency.

(7) The receiver tuning dial should indicate 1000 mc ± 1%.

(8) If the tuning dial indication exceeds the ± 1% tolerance, adjust C6 so that the indication is within tolerance.

(9) Repeat steps (4) through (7) for 500 mc.

(10) If the tuning dial indication exceeds the ± 1% tolerance, adjust C7 so that the indication is within tolerance.

(11) Repeat steps (4) through (7) for 750 mc.

(12) Repeat steps (4) through (7) for 1000 mc.

(13) Repeat step (8) if necessary.

d. 60-mc Mixer Alignment. The tuning inductors L15 and L16 in the 60-mc cascode amplifier are factory aligned and should not be adjusted in the field. If alignment of these inductors is necessary, it must be accomplished at the factory.

(1) Repeat c. steps (1) through (6).

(2) Adjust the receiver manual gain for approximately one-half scale reading in the signal strength meter (see paragraph 32).

(3) Adjust L17 for maximum reading on the receiver signal strength meter.

37. Maintenance of Gear Train Assembly

An exploded view of the gear train assembly is shown in figure 15.

a. Disassembly. Disassembly of the gear train assembly is accomplished as follows:

(1) Remove the band selector and tuning knobs from the front panel.

(2) Remove the four screws at each corner of the front panel, unclip the two dial indicator lamps and gently slide the front panel out and down, taking care not to damage the electrical leads on the rear of the panel.

(3) Release the band selector switch shaft and slide the switch back and out of the assembly.

(4) Remove the gear train assembly from the equipment by removing the two stand-off post screws on the cover of the low band tuner and releasing the Allen setscrews on the rear of the anti-backlash gears for both tuners. Carefully slide the assembly out from the inductuner shafts.

(5) The assembly may now be disassembled as shown in figure 15.

b. Repair and Lubrication.

(1) All defective parts may be replaced individually with the exception of the gear box assemblies which must be replaced as a unit.

(2) The gear train assembly requires no periodic lubrication. If the gears are cleaned, a light oil coating should be applied with a cloth prior to reassembly.

CAUTION

Never apply lubrication to the friction drive plates.

c. Reassembly. Reassembly is exactly the opposite of disassembly. Adjustment of tuning dial stops is described in paragraph 34.

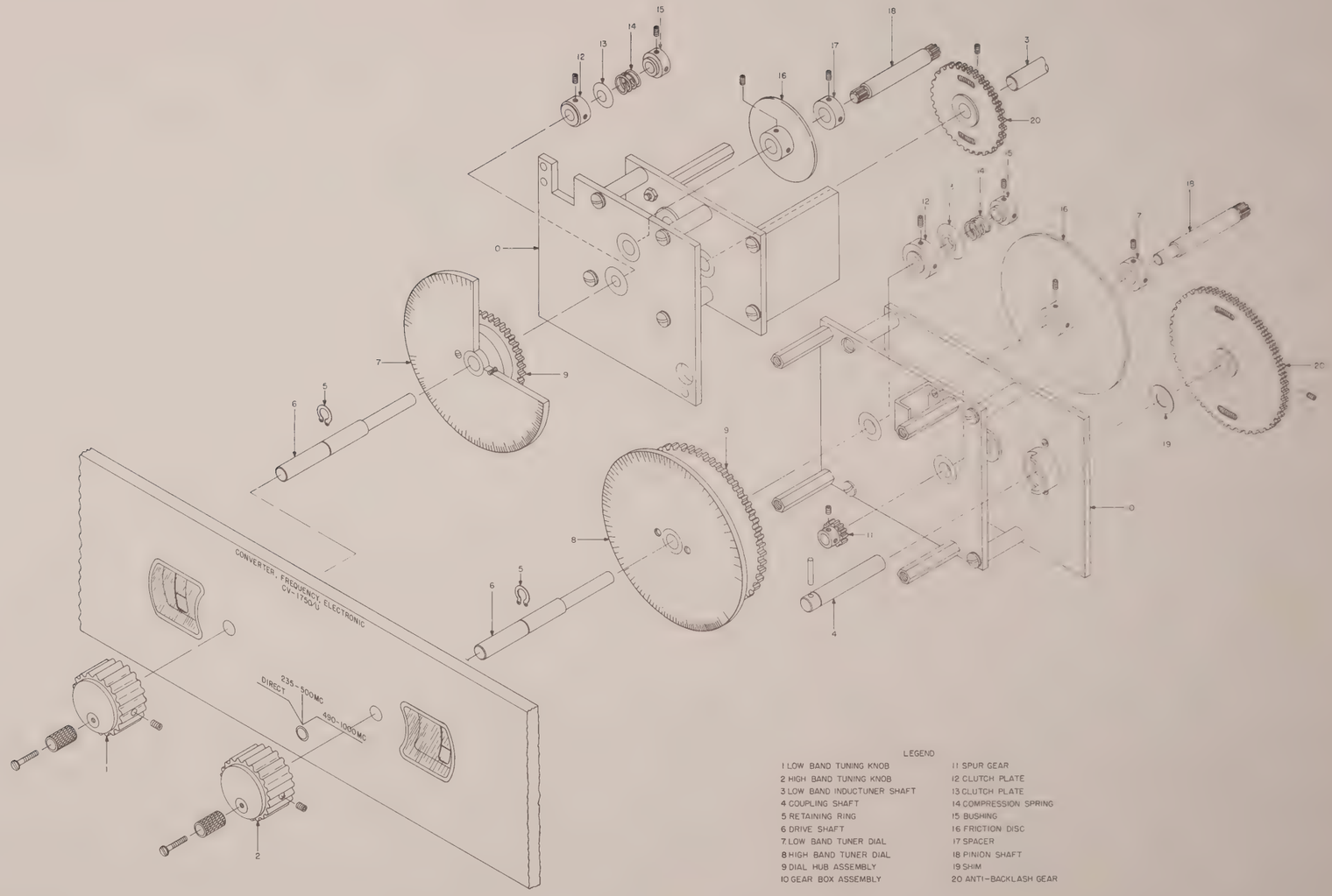


Figure 15. Gear Trains, Exploded View

CHAPTER 5

THEORY

38. General Functional Description

The Electronic Frequency Converter CV-1750/U is used to extend the range of any receiver which will tune to 60 mc to include the range of 235 mc-1000 mc. The UHF signal is converted to 60 mc and then applied to the receiver tuned to 60 mc. The frequency converter basically consists of three antenna inputs, a low band tuner, a high band tuner, and a band selector circuit. Complete schematic diagrams are shown in figures 16 through 19.

a. Band Selector. The band selector circuit connects the output of the antenna which provides signals below 235 mc to the output jack when the band selector is in the DIRECT position. In the 235-500 MC position, the circuit connects the 60-mc i-f output from the low band tuner to the output jack. The 60-mc i-f output from the high band tuner is connected to the output jack when the band selector circuit is in the 490-1000 MC position.

b. Low Band Tuner. The low band tuner consists of an r-f amplifier, a local oscillator, and a mixer.

(1) The input circuit matches the antenna impedance to the input impedance of the first stage.

(2) The local oscillator is operated in a modified Colpitts configuration. The operating frequency is maintained 60 mc above the carrier. The stability is increased by the use of a regulated filament supply. The output signal from the oscillator is coupled to the mixer.

(3) The signals from the amplifier and the oscillator are applied to the grid of the mixer to produce a 60 mc i-f. This output signal is coupled to the output of the frequency converter by a pi-network.

c. High Band Tuner. The high band tuner is composed of a quadruple-tuned preselector, a local oscillator, a crystal mixer, and a 60 mc i-f amplifier.

(1) The input signal is coupled through a preselector where tuning is accomplished by four tuned cavities which are resonated to a carrier frequency. The output of the fourth cavity is coupled to the crystal mixer.

(2) The local oscillator is operated in a grounded-plate configuration. The oscillator frequency is maintained 60 mc above the carrier and this signal is coupled to the mixer.

(3) The low-noise 60 mc i-f amplifier consists of two tubes connected in cascode configuration. Both stages are neutralized.

(4) The crystal mixer receives signals from the preselector and the local oscillator. The 60 mc i-f output from the mixer is applied to the 60-mc i-f amplifier.

d. Power Supply. The power supply operates at either 115 vac or 230 vac, 50-60/400 cps by switching the transformer primary windings from parallel to series operation. Three secondary windings supply power for the pilot lamp, the dial lamps, and most of the filaments; a full-wave rectifier circuit; and a bridge rectifier circuit.

39. Detailed Circuit Analysis

The operation of the circuits in the Electronic Frequency Converter CV-1750/U is described in detail for each stage.

a. Power Supply. (See fig. 16 and fig. 19) The power supply is operated from either 115 or 230 vac, 50 to 400 cps. The set-up for the desired voltage is obtained through the use of switch S2 which places the two power transformer primaries in series for 230-vac operation and in parallel for 115-vac operation. Three secondary windings are used to supply all necessary voltages to the equipment. One winding supplies 6.3 vac for the pilot light, the dial lights, and most of the filaments. A second winding supplies a full-wave rectifier whose output is RC filtered and regulated to +150 vdc by Zener diode CR8. The third winding powers a bridge rectifier whose output is -24 vdc. From the center tap on this same winding a voltage is obtained which is filtered and regulated at -6.3 vdc. To regulate the -6.3 vdc, transistor Q1 is used in a conventional series regulator configuration with

Zener diode A3CR7 providing the reference voltage. A tendency of the -6.3 vdc to vary from that value changes the effective emitter-to-base current of Q1, thereby changing the collector-to-emitter conductivity of Q1 in a manner such as to tend to restore the voltage at the Q1 emitter back to -6.3 vdc.

Low Band Tuner, A1. (see fig. 17)

(1) The low band tuner amplifier consists of two type 7077 ceramic triodes both in grounded-grid configuration. The input impedance at jack J2 is designed for a 50-ohm antenna. The input circuit matches this 50 ohms to the input impedance of the first stage, V1. Interstage coupling and coupling from the second stage to the mixer is by means of double-tuned circuits. Tuning within the amplifier is by means of inductors L3A, L3B, L3C, L3D, and L3E, five sections of a six-section inductuner. To keep the two stages stabilized, the cathodes are returned to ground through a -6.3 vdc regulated source. The connection of their cathodes to this source is through two 1000-ohm resistors, R1 and R3, which provide dc degeneration to help normalize the effect of tube variations.

(2) The low band tuner local oscillator, V4, is a type 7486 triode operated in a modified Colpitts configuration. The tank circuit is tuned by inductor L3F, a section of the inductuner. The operating frequency is kept 60 mc above the carrier. Oscillator stability is increased by the use of a regulated -6 vdc filament supply. The oscillator's signal is coupled to the mixer through capacitor C28.

(3) Fine tuning is accomplished by a voltage-variable capacitor, CR1, which varies the shunt capacitance of the tank circuit. The voltage-variable capacitor is a semi-conductor device whose capacitance varies with the voltage across it. The capacitance of CR1 is controlled by a dc voltage which reaches it through resistors R13 and R15. The level of the voltage is controlled by the fine tuning potentiometer, R9, which is in series with resistor R8 between +150 vdc and ground.

(4) The low band mixer, V3, is a type 7587 Nuvistor tetrode. Both the signal from the r-f amplifier and the local oscillator output are applied to its grid. The two signals are mixed to produce a 60-mc i-f. An oscilloscope can be connected at test point TP1 in the grid circuit to check oscillator injection and also to check r-f tuning and response. The mixer output signal is coupled to the output via a pi-network. This pi-network lowers the output impedance to 50 ohms.

High Band Tuner, A2. (see fig. 18)

(1) In the high band r-f input circuit, L1 presents an impedance designed for a 50-ohm antenna across the entire band. From L1 the signal is coupled through the quadruple-tuned preselector. Tuning is accomplished by four tuned cavities. The signal passes from cavity to cavity through coupling irises. The cavities are resonated to a carrier frequency by changing the capacitance between the inner conductor and the wall. The action effectively produces quarter-wave tuning and is analogous to coaxial-line cavity tuning in which the resonant frequency is determined by the position of the plunger. From the fourth cavity, inductor L6 couples the signal to the crystal mixer.

(2) The high band tuner local oscillator, V1, is a type 7486 ceramic planar triode operated in a grounded-plate configuration. The tank circuit is a length of transmission line. Capacitor C1E, ganged with the high band tuning control, loads the transmission line so as to make its effective length one-half wavelength at the desired frequency. The oscillator is operated at a frequency 60 mc above

the carrier.

(3) Fine tuning is accomplished by the use of voltage-variable capacitor CR2 in the same manner fine tuning is obtained in the low band tuner. Oscillator signal injection to the mixer is accomplished by inductor L6 whose lower end reaches into the chamber in which the oscillator stage is mounted.

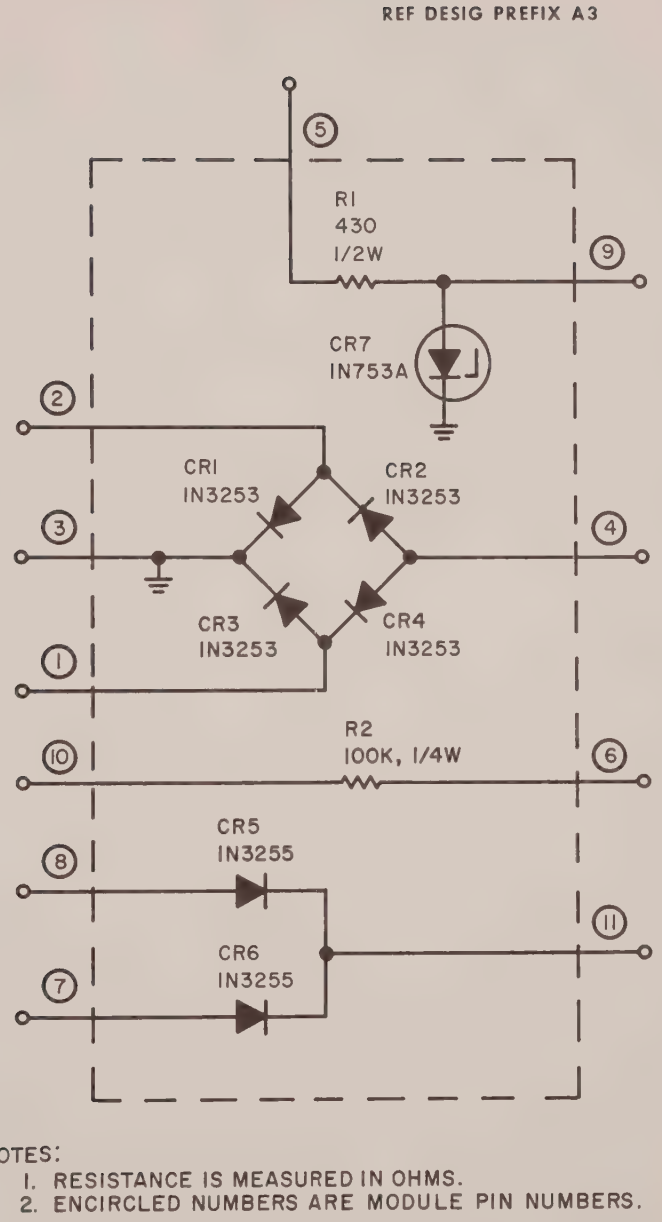
(4) The high band tuner contains a low-noise 60-mc i-f amplifier which consists of two type 6CW4 tubes, V2 and V3. They are connected in cascode configuration. The two stages are neutralized by the adjustment of inductor L16.

(5) The high band tuner mixer, CR1, is a type 1N82A crystal diode. Through inductor L6 it receives both the incoming carrier and the oscillator injection signal. Jack J4 is present to facilitate the checking of the oscillator injection level for field maintenance.

d. Band Selector. (see fig. 19)

(1) The band selector circuit consists of a four-pole, three-position switch S3, and two relay-controlled coaxial switches, K1 and K2. The two coaxial switches are controlled by a -24 vdc applied to them through S3A. When S3 is at the DIRECT position, neither relay is actuated, a condition causing the J3 input to be coupled to the output, J5, through jacks J8 and J9. When S3 is at the low position, K2 is actuated and K1 is not. This causes the low band tuner output to be coupled to the output, J5. When S3 is at the high position, both K1 and K2 are actuated. This causes the high band tuner output to be coupled to the output, J5.

(2) While bringing about the appropriate coupling to the output, S3 also places the proper tuner in operation. When S3 is at the low position, the low band tuner is placed in operation by switch section S3B which applies -6.3vdc to it and section SC3 which applies a regulated +150 vdc to it. When S3 is at the high position, the high band tuner is placed in operation by switch section S3C which applies +150 vdc to it.



NOTES:
1. RESISTANCE IS MEASURED IN OHMS.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.

Figure 16. Power Supply Module, Schematic Diagram

REF DESIG PREFIX A1

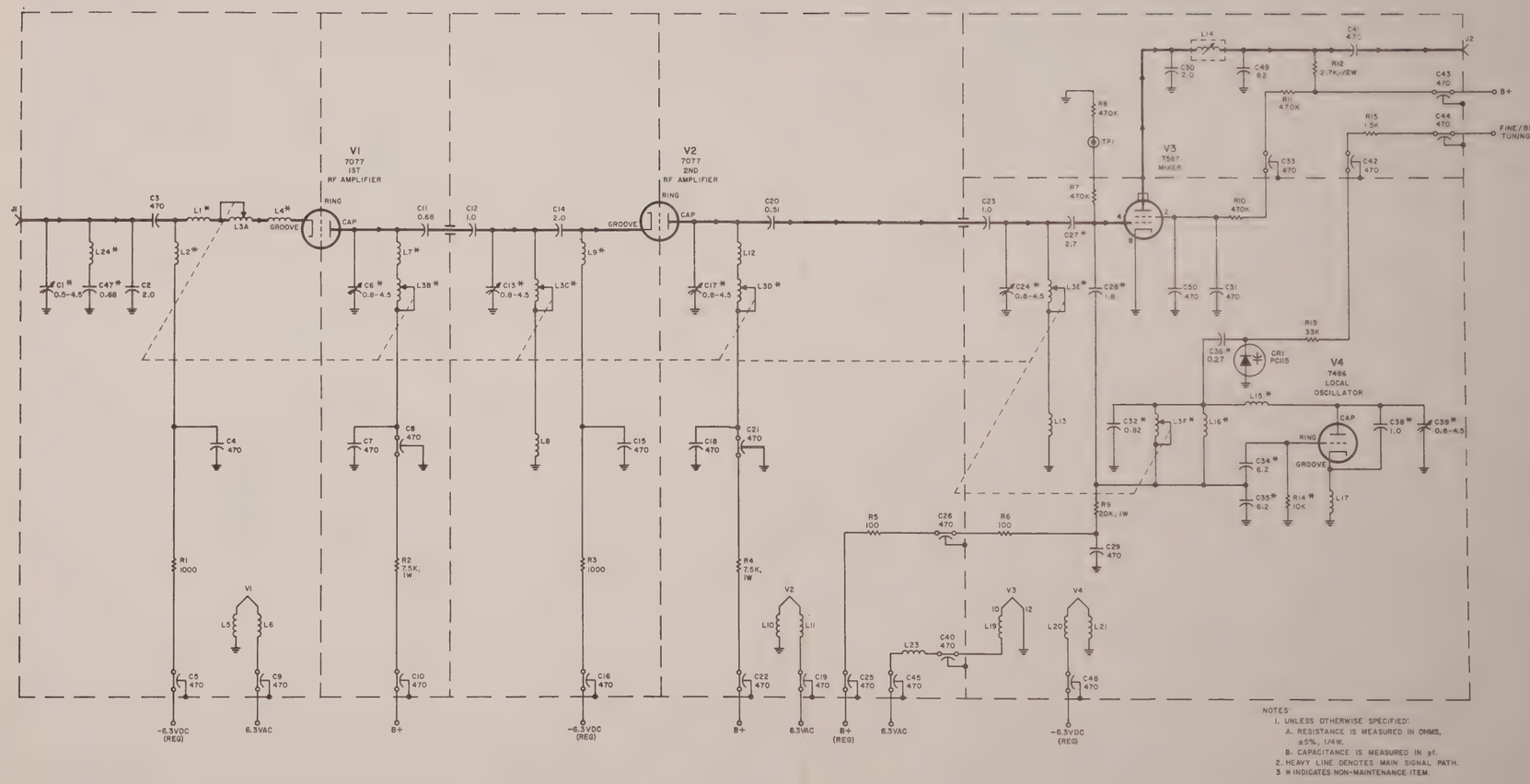
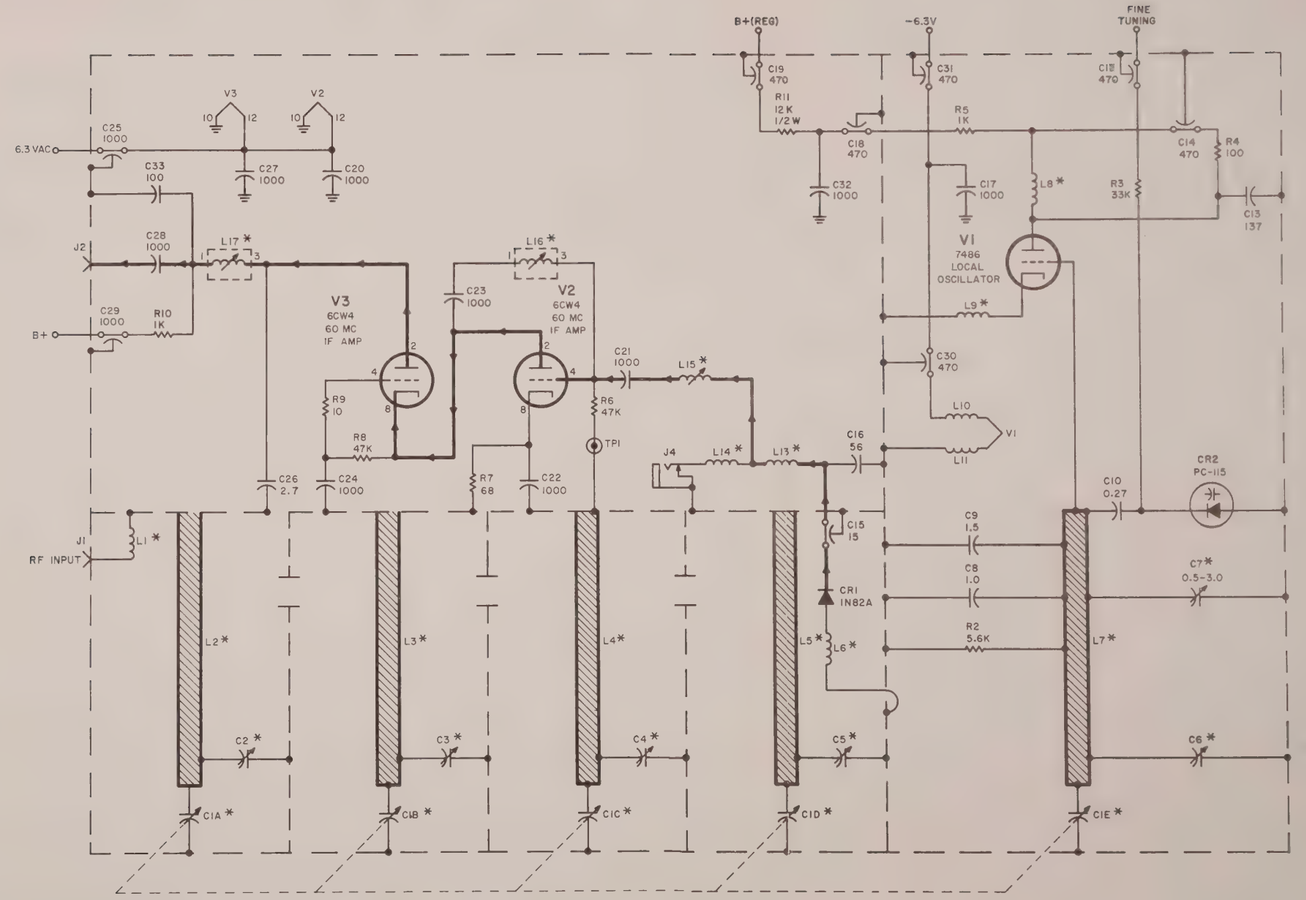


Figure 17. 235-500 mc Tuner, Schematic Diagram

REF DESIG PREFIX A2



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   B. CAPACITANCE IS MEASURED IN pf.
2. HEAVY LINE DENOTES MAIN SIGNAL PATH.
3. * INDICATES NON-MAINTENANCE ITEM.

Figure 18. 490-1000 mc Tuner, Schematic Diagram

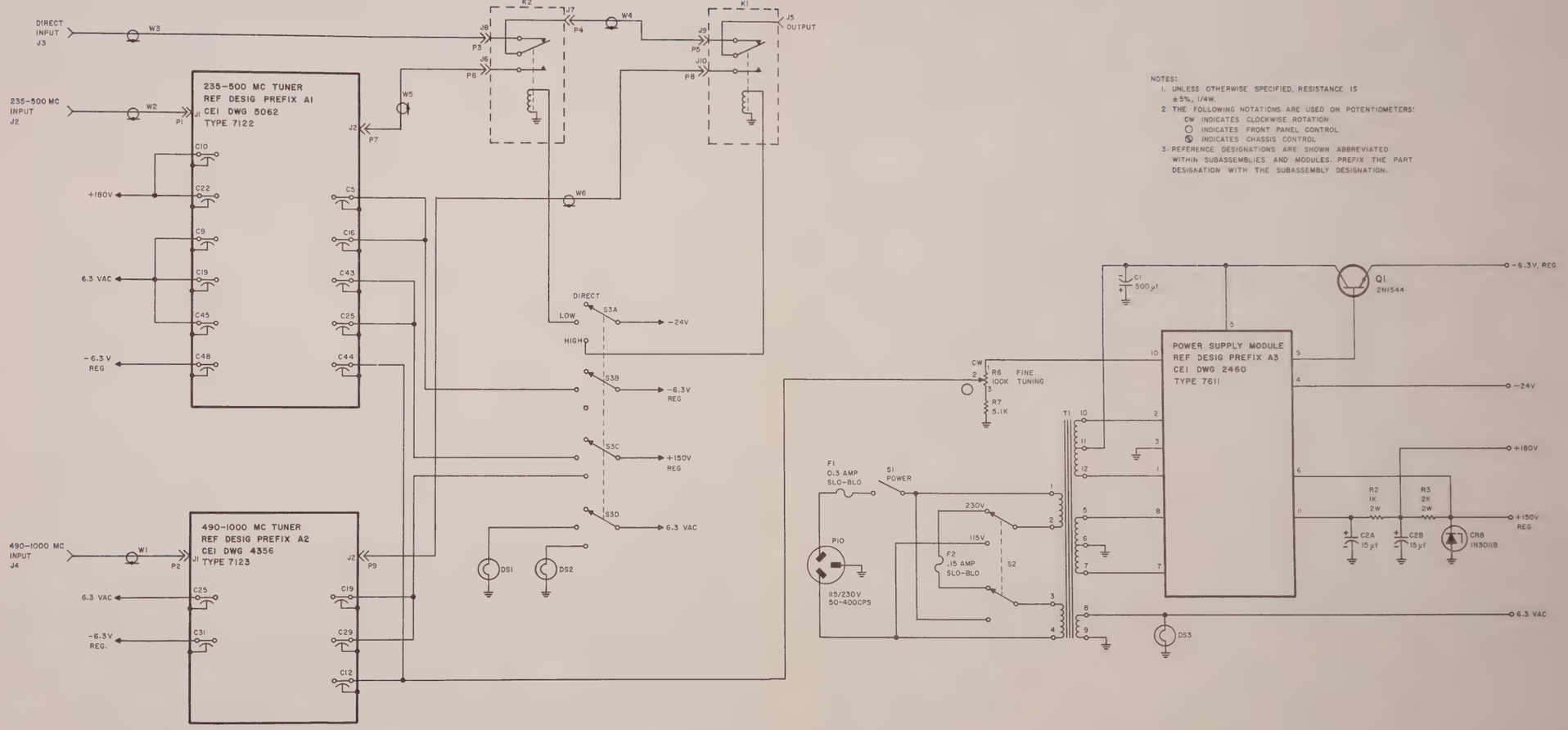


Figure 19. Electronic Frequency Converter CV-1750/U, Main Chassis Schematic Diagram

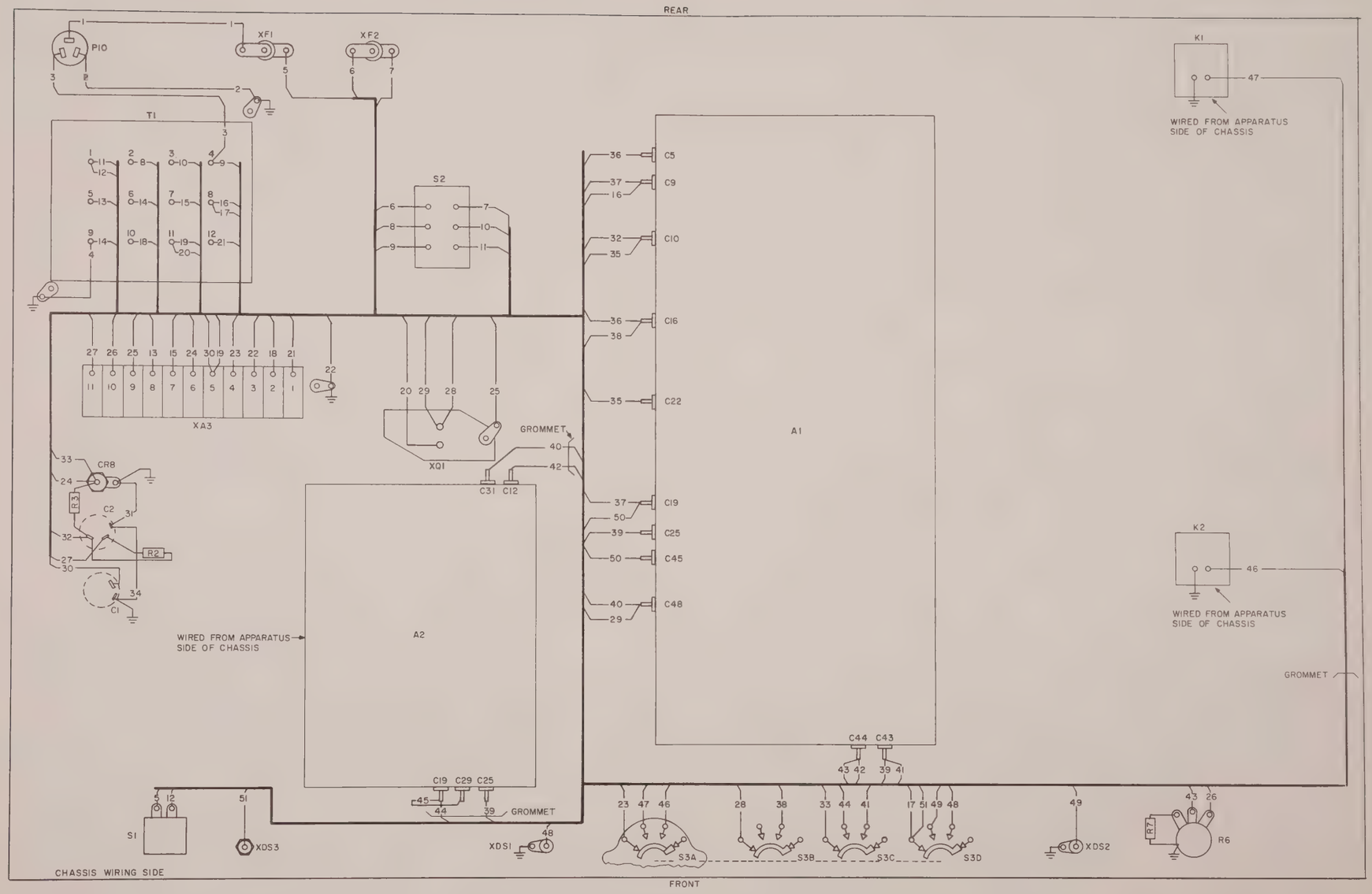


Figure 20. Electronic Frequency Converter CV-1750/U, Wiring Diagram

CHAPTER 6

SHIPMENT AND LIMITED STORAGE

Section I. Shipment and Limited Storage

40. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends upon the material available and the conditions under which the equipment is to be shipped or stored. Always insure that the equipment is repacked to withstand harsh treatment. Refer to paragraph 8 and reverse the instructions given in that paragraph.

b. Whenever practicable, place a dehydrating agent such as silica gel around the case. Protect the case with a waterproof paper barrier. Seal the seams of the paper barrier with waterproof sealing compound or tape. Pack the protected case in a padded wooden case or a fiberboard box, providing at least 3 inches of excelsior padding or some similar material between the paper barrier and the packing case.

c. The packing case should be marked: FRAGILE-ELECTRONIC EQUIPMENT INSIDE, and the shipping destination of the equipment should be clearly indicated.

Section II. Demolition of Material to Prevent Enemy Use

41. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. The destruction procedures outlined in paragraph 42 will be used to prevent further use of the equipment.

42. Methods of Destruction

Use any or all of the following methods to destroy the equipment.

a. Smash. Smash the controls, tubes, coils, relays, switches, capacitors and transformers; use sledges, axes, handaxes, pickaxes, hammers, or crowbars.

b. Cut. Cut all cables and cords and slash the wiring on the components; use axes, handaxes, or machetes.

c. Burn. Burn cords and technical manuals; use gasoline, kerosene, oil, flame-throwers, or incendiary grenades.

d. Bend. Bend panels and cabinets.

WARNING

Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.

e. Explode. If explosives are necessary, use firearms, grenades, or TNT.

f. Dispose. Bury or scatter the destroyed parts in slit trenches or foxholes, or throw them into streams.

CHAPTER 7

IDENTIFICATION TABLE OF PARTS

43. Unit Numbering Method

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules), and parts. An example of the unit method follows:

Read from right to left as: First (1) resistor (R) of first (1) subassembly (A)

As shown on the main chassis schematic, components which are an integral part of the main chassis have no subassembly designation.

44. Reference Designation Prefix

Partial reference designations have been used on the equipment and on the illustrations in this manual. The partial reference designations consist of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Prefixes are provided on drawings and illustrations following the notation "REF DESIG PREFIX".

45. Repair Parts List

The Identification Table of Parts presented on the following pages lists the repair parts for the frequency converter. Those parts which cannot be replaced at any echelon of maintenance are denoted in the table by an asterisk.

7122	CONTRACTOR: COMMUNICATION ELECTRONICS INCORPORATED				CONTRACT NO.: DA18-119-AMC-02854(X)		
REF. SYM. OR PART NUMBER (1)	NAME OF PARTS OR DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	MAN-AGER (6)	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)	REF FIGURE (9)
Fig. 6 Fig. 7	CONVERTER, frequency, electronic, CV1750/U: Aluminum chassis and front panel; grey enamel finished front panel with black photo etched overlay; 3.500 in. h, by 19.000 in. w, by 13.200 in. d incl handles; 235 to 1000 mc incoming frequency range, 60 mc output frequency; requires either 115 or 230 vac, 50-400 cps, single phase power.	Intercept signals propagated by a transmitter with effective tuning range of 235-1000 mc and converts received signals to a 60 mc output; extends tuning range of any receiver capable of tuning to 60 mc.				5820-070-7967		
Fig. 8 A1	AMPLIFIER, radio frequency: brass chassis, silver-plated, gold-flashed, 3.000 in. h by 4.000 in. w by 9.750 in. d o/a dim., 235-500 mc input frequency range, 60 mc output frequency, 50 ohm input and output impedance; Communication Electronics, Inc. 7122.	Tunes the 235-500 mc frequency range and converts received signals to 60 mc.	A1			5820-776-6877	1	6
A1C1*	CAPACITOR, variable, ceramic dielectric: 0.5 pf min, 4.5 pf max, 500 wvdc, screw driver slot adjustment, 0.594 in. lg, mtd by no. 8-32 thd bushing, solder tab terminals; Cambridge Thermionic CST6.	Padder capacitor for A1C2.	A1C1				1	8
A1C2	CAPACITOR, fixed, ceramic dielectric: 2.0 pf ±0.25 pf, 500 wvdc; per MIL-C-20.	Part of a capacitive voltage divider	A1C2, A1C14, A1C30	CC20CK020C		5910-842-2292	3	8

*Indicates Non-Maintenance Item

CONTRACTOR: COMMUNICATION ELECTRONICS INCORPORATED						CONTRACT NO.: DA18-119-AMC-02854(X)		
REF. SYM. OR PART NUMBER (1)	NAME OF PARTS OR DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	MAN-AGER (6)	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)	REF FIGURE (9)
A1C3	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 470 pf ±20 pct, insulated body, 0.187 in. lg, 0.281 in. dia, 1 terminal, eyelet solder mtg, single-ended stand-off; Allen-Bradley SS5A4712.	Coupling	A1C3, A1C4, A1C7, A1C15, A1C18, A1C29, A1C31			5910-956-8406	7	8
A1C4	CAPACITOR, Same as A1C3.	Bypass						8
A1C5	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 470 pf ±20 pct, insulated body, 0.281 in. dia, 0.422 in. lg, 1 terminal, eyelet solder mtg, double-ended feedthru; Allen-Bradley FA5C4712.	Filtering	A1C5, A1C8, A1C9, A1C10, A1C16, A1C19, A1C21, A1C22, A1C25, A1C26, A1C33, A1C40, A1C42, A1C43, A1C44, A1C45, A1C48, A2C12, A2C14, A2C18, A2C19, A2C30, A2C31			5910-956-8401	23	8
A1C6*	CAPACITOR, variable, glass dielectric: 1 section, 0.5 pf min, 4.5 pf max, 1000 wvdc, screw driver type, 0.312 in. dia, 0.312 in. lg o/a dim., 0.250 in. lg bushing; Roanwell MG 1305.	Part of a tuned circuit.	A1C6, A1C13, A1C17, A1C24, A1C39				5	8
A1C7	CAPACITOR, Same as A1C3.	Bypass						8
A1C8	CAPACITOR, Same as A1C5.	Bypass						8
A1C9	CAPACITOR, Same as A1C5.	Filtering						8
A1C10	CAPACITOR, Same as A1C5.	Filtering						8

*Indicates Non-Maintenance Item

CONTRACTOR: COMMUNICATION ELECTRONICS INCORPORATED						CONTRACT NO.: DA18-119-AMC-02854(X)		
REF. SYM. OR PART NUMBER (1)	NAME OF PARTS OR DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	MAN-AGER (6)	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)	REF FIGURE (9)
A1C11	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 0.68 pf ±10 pct, insulated body, 0.218 in. dia, 0.500 in. lg, 2 wire lead terminals; Quality Components QCO.68PFPORM10PCT.	Coupling	A1C11, A1C47				2	8
A1C12	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 1.0 pf ±10 pct, insulated body, 0.218 in. dia, 0.500 in. lg, 2 wire lead terminals; Quality Components MC1PFPORM10PCT.	Coupling	A1C12, A1C23			5910-226-0474	2	8
A1C13*	CAPACITOR, Same as A1C6.	Part of a tuned circuit.						8
A1C14	CAPACITOR, Same as A1C2.	Blocking						8
A1C15	CAPACITOR, Same as A1C3.	Bypass						8
A1C16	CAPACITOR, Same as A1C5.	Filtering						8
A1C17	CAPACITOR, Same as A1C6.	Part of a tuned circuit.						8
A1C18	CAPACITOR, Same as A1C3.	Bypass						8
A1C19	CAPACITOR, Same as A1C5.	Filtering						8
A1C20	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 0.51 pf ±10 pct, insulated body, 0.218 in. dia, 0.500 in. lg, 2 wire lead terminals; Quality Components QCO.51PFPORM10PCT.	Coupling	A1C20			5910-668-4253	1	8
A1C21	CAPACITOR, Same as A1C5.	Bypass						8

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A1C22	CAPACITOR, Same as A1C5.	Filtering						8
A1C23	CAPACITOR, Same as A1C12.	Coupling						8
A1C24*	CAPACITOR, Same as A1C6.	Part of a tuned circuit.						8
A1C25	CAPACITOR, Same as A1C5.	Filtering						8
A1C26	CAPACITOR, Same as A1C5.	Filtering						8
A1C27	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 2.7 pf ±0.25 pf, uninsulated body, 0.200 in. dia, 0.400 in. lg, 2 wire lead terminals; Erie 301COJ279C.	Coupling	A1C27, A2C26			5910-226-0475	2	8
A1C28	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 1.8 pf ±0.25 pf, uninsulated body, 0.200 in. dia, 0.400 in. lg, 2 wire lead terminals; Erie 301-000COKO189C.	Coupling	A1C28			5910-226-0476	1	8
A1C29	CAPACITOR, Same as A1C3.	Bypass						8
A1C30	CAPACITOR, Same as A1C2.	Part of a filter.						8
A1C31	CAPACITOR, Same as A1C3.	Bypass						8
A1C32	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 0.82 pf ±10 pct, insulated body, 0.218 in. dia, 0.500 in. lg, 2 wire lead terminals; Quality Components MC0.82PFPORM10PCT.	Part of a tuned circuit.	A1C32			5910-889-2392	1	8

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REF. SYM. OR PART NUMBER (1)	NAME OF PARTS OR DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	MAN-AGER (6)	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)	REF FIGURE (9)
A1C33	CAPACITOR, Same as A1C5.	Filtering						8
A1C34	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 6.2 pf ±0.5 pf, uninsulated body, 0.200 in. dia, 0.400 in. lg, 2 wire lead terminals; Erie 301COH629D.	Part of a capacitive voltage divider.	A1C34				1	8
A1C35	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 6.2 pf ±0.5 pf, uninsulated body, 0.200 in. dia, 0.400 in. lg, 2 wire lead terminals; Erie 301U2J629D.	Part of a capacitive voltage divider.	A1C35				1	8
A1C36	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 0.27 pf ±10 pct, insulated body, 0.218 in. dia, 0.500 in. lg, 2 wire lead terminals; Quality Components MCO.27PFPORM10PCT.	Blocking	A1C36, A2C10			5910-226-0479	2	8
A1C37	NOT USED							
A1C38	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 1.0 pf ±0.25 pf, uninsulated body, 0.200 in. dia, 0.400 in. lg, 2 wire lead terminals; Erie 301-000COKO109B.	Feedback	A1C38, A2C8			5910-957-4887	2	8
A1C39*	CAPACITOR, Same as A1C6.	Part of a tuned circuit.						8
A1C40	CAPACITOR, Same as A1C5.	Filtering						8
A1C41	CAPACITOR, fixed, ceramic dielectric: 470 pf ±20 pct, 1,000 wvdc; per MIL-C-11015.	Coupling	A1C41, A1C50	CK60AW471M		5910-781-3802	2	8

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A1C42	CAPACITOR, Same as A1C5.	Filtering						8
A1C43	CAPACITOR, Same as A1C5.	Filtering						8
A1C44	CAPACITOR, Same as A1C5.	Filtering						8
A1C45	CAPACITOR, Same as A1C5.	Filtering						8
A1C46	NOT USED							
A1C47	CAPACITOR, Same as A1C11.	Part of a filter.						8
A1C48	CAPACITOR, Same as A1C5.	Filtering						8
A1C49	CAPACITOR, fixed, mica dielectric: 1 section, 500 wvdc, 82 pf ±5 pct, -55 deg C to 125 deg C oper temp range, plastic case, 0.200 in. thk, 0.350 in. w, 0.370 in. lg, 2 wire lead terminals; Electro Motive DM10-820J.	Part of a filter.	A1C49			5910-226-0470	1	8
A1C50	CAPACITOR, Same as A1C41.	Bypass						8
A1CR1	SEMICONDUCTOR DEVICE, diode: varicap, 10 pf ±20 pct, 100 wvdc 0.125 in. dia, 0.300 in. lg, hermetically sealed, 2 wire lead terminals; TRW/Pacific Semiconductors PC115.	Voltage variable capacitor used to change oscillator frequency as a function of applied voltage.	A1CR1, A2CR2			5961-226-0404	2	8
A1J1	CONNECTOR, receptacle, electrical: type BNC; per MIL-C-3608.	RF input connector.	A1J1, A2J1	UG535/U		5935-259-0817	2	

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A1J2	CONNECTOR, receptacle, electrical: 1 male contact, 1 connector mating end, low-loss plastic dielectric, 50 ohms impedance, straight shape, 0.671 in. lg, mtd by 10-32 in. thd bushing; Amphenol 27-9.	IF output connector.	A1J2, A2J2			5935-518-9551	2	8
A1L1*	COIL, radio frequency: brass strip, 0.091 in. thk, silver-plated; Communication Electronics, Inc. 1966.	Series Trimmer for A1L3A.	A1L1				1	8
A1L2*	COIL, radio frequency: 17 turns, closewound, no. 27SN conductor, iron coil form, 0.107 in. dia, 0.375 in. lg, 2 wire lead terminals; Communication Electronics, Inc. 1131-21.	Trimmer coil.	A1L2, A1L5, A1L6, A1L9, A1L10, A1L11, A1L17, A1L19, A1L20, A1L21, A1L23				11	8
A1L3A, B, C, D, E, F	TUNER, radio frequency: six-section spiral inductuner; Communication Electronics, Inc. 2208-2.	Tunes frequency range of tuner.	A1L3A, B, C, D, E, F				1	8
A1L4*	COIL, radio frequency: copper strip, 0.012 in. thk, 0.12 in. w, tin plated; Communication Electronics, Inc. 1967.	RF choke	A1L4				1	8
A1L5*	COIL, Same as A1L2.	RF choke						8
A1L6*	COIL, Same as A1L2.	RF choke						8
A1L7*	COIL, radio frequency: no. 20 AWG copper wire, 1.000 in. lg, bend 90 deg at 0.500 in.; Communication Electronics, Inc. 1968.	Padder for A1L3B.	A1L7				1	8

*Indicates Non-Maintenance Item

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A1L8*	COIL, radio frequency: no. 20 AWG copper wire, 0.690 in. lg, bend 90 deg at 0.440 in.; Communication Electronics, Inc. 1969.	Padder for A1L3C.	A1L8				1	8
A1L9*	COIL, Same as A1L2.	Part of a decoupling network.						8
A1L10*	COIL, Same as A1L2.	RF choke						8
A1L11*	COIL, Same as A1L2.	RF choke						8
A1L12*	COIL, radio frequency: no. 20 AWG copper wire, 1.120 in. lg, bend 90 deg at 0.620 in.; Communication Electronics, Inc. 1970.	Padder for A1L3D.	A1L12				1	8
A1L13*	COIL, radio frequency: no. 20 AWG copper wire, 1.060 in. lg, bend to shape of horseshoe with 0.380 in. legs; Communication Electronics, Inc. 1971.	Padder for A1L3E.	A1L13				1	8
A1L14*	COIL, radio frequency: 13 turns, no. 26 SNS conductor, closewound, 1.727 in. lg o/a; Communication Electronics, Inc. 2171-15.	Part of pi-network filter.	A1L14				1	8
A1L15*	COIL, radio frequency: 0.313 in. w, 1.063 in. lg o/a dim.; Communication Electronics, Inc. 1234.	Padder for A1L3F.	A1L15				1	8
A1L16*	COIL, radio frequency: 11 turns, no. 27 SN conductor, closewound, plastic coil form, 0.107 in. dia, 0.375 in. lg o/a dim., 2 wire lead terminals; Communication Electronics, Inc. 1131-34.	Padder for A1L3F.	A1L16				1	8

*Indicates Non-Maintenance Item

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A1L17*	COIL, Same as A1L2.	RF choke						8
A1L18	NOT USED							
A1L19*	COIL, Same as A1L2.	RF choke						8
A1L20*	COIL, Same as A1L2.	RF choke						8
A1L21*	COIL, Same as A1L2.	RF choke						8
A1L22	NOT USED							
A1L23*	COIL, Same as A1L2.	RF choke						8
A1L24*	COIL, radio frequency: 6 turns, no. 18 SNS conductor, closewound; Communication Electronics, Inc. 1129-04.	Part of a filter	A1L24				1	8
A1R1	RESISTOR, fixed, composition: 1K ±5 pct, 1/4W; per MIL-R-11.	Part of a decoupling network.	A1R1, A1R3, A2R5, A2R10	RC07GF102J		5905-681-6462	4	8
A1R2	RESISTOR, fixed, composition: 7.5K ±5 pct, 1W; per MIL-R-11.	Dropping	A1R2, A1R4	RC32GF752J			2	8
A1R3	RESISTOR, Same as A1R1.	Part of a decoupling network.						8
A1R4	RESISTOR, Same as A1R2.	Dropping						8
A1R5	RESISTOR, fixed, composition: 8.2K ±5 pct, 1/2W; per MIL-R-11.	Part of a filter.	A1R5	RC20GF822J			1	8
A1R6	RESISTOR, fixed, composition: 100 ohms ±5 pct, 1/4W; per MIL-R-11.	Part of a filter.	A1R6, A2R4	RC07GF101J		5905-683-7721	2	8

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REF. SYM. OR PART NUMBER (1)	NAME OF PARTS OR DESCRIPTION (2)	FUNCTION (3)	ALL SYMBOLS AND PART NUMBERS INVOLVED (4)	JAN OR MIL TYPE NUMBER (5)	MAN-AGER (6)	FEDERAL STOCK NUMBER (7)	TOTAL NUMBER PARTS PER END ITEM (8)	REF FIGURE (9)
A1R7*	RESISTOR, fixed, composition: 470K ±5 pct, 1/4W; per MIL-R-11.	Part of a voltage divider.	A1R7, A1R8, A1R10, A1R11	RC07GF474J		5905-681-8957	4	8
A1R8	RESISTOR, Same as A1R7.	Part of a voltage divider.						8
A1R9	RESISTOR, fixed, composition: 20K ±5 pct, 1W; per MIL-R-11.	Part of dc return for A1V4 plate.	A1R9	RC32GF203J			1	8
A1R10	RESISTOR, Same as A1R7.	Dropping						8
A1R11	RESISTOR, Same as A1R7.	Part of a voltage divider.						8
A1R12	RESISTOR, fixed, composition: 2.7K ±5 pct, 1/2W; per MIL-R-11.	Part of a voltage divider.	A1R12	RC20GF272J		5905-279-1880	1	8
A1R13	RESISTOR, fixed, composition: 33K ±5 pct, 1/4W; per MIL-R-11.	Part of a voltage divider.	A1R13, A2R3	RC07GF333J		5905-686-3903	2	8
A1R14	RESISTOR, fixed, composition: 10K ±5 pct, 1/4W; per MIL-R-11.	A1V4 grid leak resistor.	A1R14	RC07GF103J		5905-683-2238	1	8
A1R15	RESISTOR, fixed, composition: 1.5K ±5 pct, 1/4W; per MIL-R-11.	Part of a voltage divider.	A1R15	RC07GF152J		5905-683-7723	1	8
A1TP1	JACK, tip: insulated, low-loss plastic, white, 3500 VAC nom. rating, single through hole mtg, 0.218 in. dia, 0.438 in. lg o/a dim., terminal stud for wire attachment; Taurus TJ6.	Test jack	A1TP1				1	8
A1V1	ELECTRON TUBE: ceramic triode; per MIL-E-1.	RF amplifier	A1V1, A1V2	7077		5960-688-6706	2	8
A1V2	ELECTRON TUBE, Same as A1V1.	RF amplifier						8

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A1V3	ELECTRON TUBE: nuvistor tetrode; per EIA 7587.	Mixer	A1V3			5960-852-5545	1	8
A1V4	ELECTRON TUBE: ceramic triode; per EIA 7486	Local oscillator	A1V4, A2V1			5960-845-9953	2	8
A1XV1	SOCKET, electron tube: for 7077 tube, 0.625 in. w, 0.860 in. h, 1.281 in. lg, mtd by two 2-56 screws, contacts berryllium copper, insulator low-loss compression molded material; Jettron 86-040.	Mounts A1V1	A1XV1,A1XV2			5935-785-8823	2	8
A1XV2	SOCKET, Same as A1XV1.	Mounts A1V2.						8
A1XV3	SOCKET, electron tube: 5 pin nuvistor contact configuration, cadmium plated brass contacts, molded, low-loss composition body, 0.469 in. h, 0.562 in. dia, 5 solder tab contact terminals, clinch type mtg; Cinch 133-65-10-001.	Mounts A1V3.	A1XV3			5935-885-1010	1	8
A1XV4	SOCKET, electron tube: socket kit for 7486 tube, contacts berryllium copper, steel template, 10 eyelets; Jettron 86-085.	Mounts A1V4.	A1XV4				1	8

7123	CONTRACTOR COMMUNICATION ELECTRONICS INCORPORATED				CONTRACT NO. DA18-119-AMC-02854(X)		
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Fig. 9 A2	AMPLIFIER, radio frequency: brass chassis, silver-plated, gold-flashed, 1.750 in. h by 4.000 in. w by 5.500 in. d o/a dim.; 490 to 1000 mc input frequency range; 60 mc output frequency; 50 ohm input and output impedance; Communication Electronics, Inc. 7123.	Tunes 490-1000 mc range and converts received signals to 60 mc.	A2				1	6
A2C1A, B, C, D, E*	CAPACITOR, variable, air dielectric: 5 section tuner shaft assembly; Communication Electronics, Inc. 1271-1.	Preselector variable tuning element.	A2C1A, B, C, D, E				1	9
A2C2*	CAPACITOR, variable, air dielectric: brass sheet, 0.020 in. thk, 0.250 in. w, 0.620 in. o/a lg; Communication Electronics, Inc. 1261.	Trimmer for A2C1A	A2C2, A2C3, A2C4, A2C5				4	9
A2C3*	CAPACITOR, Same as A2C2.	Trimmer for A2C1B.						9
A2C4*	CAPACITOR, Same as A2C2.	Trimmer for A2C1C.						9
A2C5*	CAPACITOR, Same as A2C2.	Trimmer for A2C1D.						9
A2C6*	CAPACITOR, variable, air dielectric: RF trimmer plate; Communication Electronics, Inc. 1276	Trimmer for A2C8.	A2C6				1	9
A2C7*	CAPACITOR, variable, ceramic dielectric: 1 section, 0.5-3pf, 0.750 in. o/a lg, single wire lead terminal; Eire 3115-001-1R.	Trimmer for A2C9.	A2C7				1	9
A2C8	CAPACITOR, Same as A1C38.	Corrects oscillator tracking.						9

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A2C9	CAPACITOR, fixed, ceramic dielectric: 1.5 pf ±0.25 pf, 500 wvdc; per MIL-C-20.	Corrects oscillator tracking.	A2C9	CC20CK1R5C		5910-725-1709	1	9
A2C10	CAPACITOR, Same as A1C36.	Coupling						9
A2C11	NOT USED							
A2C12	CAPACITOR, Same as A1C5.	Filtering						9
A2C13	CAPACITOR, fixed, ceramic dielectric: 1 section, 137 pf ±20 pct, 500 wvdc, 0.125 in. w, 0.500 in. h, 0.500 in. lg, stand-off type, 1 solder lug terminal; General Instrument, F.W. Sickles Division 32-25394-1.	Bypass	A2C13			5910-776-6849	1	9
A2C14	CAPACITOR, Same as A1C5.	Filtering						9
A2C15	CAPACITOR, fixed, mica dielectric: 15 pf ±10 pct, 500 wvdc; per MIL-C-10950.	Filtering	A2C15	CB11RD150K		5910-284-5280	1	9
A2C16	CAPACITOR, fixed, mica dielectric: 1 section, 500 wvdc, 56 pf ±5 pct, -55 deg C to 125 deg C oper temp range, plastic case, 0.190 in. thk, 0.340 in. w, 0.370 in. lg, 2 wire lead terminals; Electromotive DM10-560J.	Part of a capacitive voltage divider.	A5C16			5910-226-0471	1	9
A2C17	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 1,000 pf minus 0 pct, plus 100 pct, insulated body, 0.187 in. lg, 0.281 in. dia, 1 terminal, eyelet solder mtg; Allen-Bradley SS5A-102W.	Bypass	A2C17, A2C24, A2C32			5910-898-0216	3	9

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A2C18	CAPACITOR, Same as A1C5.	Filtering						9
A2C19	CAPACITOR, Same as A1C5.	Filtering						9
A2C20	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 1,000 pf GMV, insulated body, 0.156 in. thk, 0.235 in. dia, 2 wire lead terminals; P. R. Mallory SM001GMV.	Bypass	A2C20, A2C21, A2C22, A2C23, A2C27, A2C28			5910-899-7745	6	9
A2C21	CAPACITOR, Same as A2C20.	Coupling						9
A2C22	CAPACITOR, Same as A2C20.	Bypass						9
A2C23	CAPACITOR, Same as A2C20.	Coupling						9
A2C24	CAPACITOR, Same as A2C17.	Bypass						9
A2C25	CAPACITOR, fixed, ceramic dielectric: 1 section, 500 wvdc, 1,000 pf minus 0 pct, plus 100 pct, insulated body, 0.281 in. dia, 0.422 in. lg, 1 terminal, eyelet solder mtg; Allen-Bradley FA5C102W.	Filtering	A2C25, A2C29			5910-802-7432	2	9
A2C26	CAPACITOR, Same as A1C27.	Coupling						9
A2C27	CAPACITOR, Same as A2C20.	Bypass						9
A2C28	CAPACITOR, Same as A2C20.	Blocking						9
A2C29	CAPACITOR, Same as A2C25.	Filtering						9
A2C30	CAPACITOR, Same as A1C5.	Filtering						9
A2C31	CAPACITOR, Same as A1C5.	Filtering						9

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A2C32	CAPACITOR, Same as A2C17.	Bypass						9
A2C33	CAPACITOR, fixed, mica dielectric: 1 section, 500 wvdc, 100 pf ±5 pct, -55 deg C to 125 deg C oper temp range, plastic case, 0.200 in. thk, 0.350 in. w, 0.370 in. lg, 2 wire lead terminals; Electro Motive DM10F101J.	Coupling	A2C33			5910-959-8347	1	9
A2CR1	SEMICONDUCTOR DEVICE, diode: silicon; per MIL-S-19500.	Crystal mixer.	A2CR1	1N82A		5961-669-6876	1	9
A2CR2	SEMICONDUCTOR, Same as A1CR1.	Fine tuning element.						9
A2J1	CONNECTOR, Same as A1J1.	RF input connector.						9
A2J2	CONNECTOR, Same as A1J2.	IF output connector.						9
A2J3	NOT USED							
A2J4	JACK, telephone: ultra-miniaturized, 2 conductors, closed circuit, nylon insulation, nickel silver springs, mounts in 0.190 in. dia hole w/10-48 nut, 0.250 in. dia, 0.531 in. lg; Switchcraft TR2A.	Meter jack used to check interstage alignment.	A2J4			5935-045-9075	1	9
A2L1*	COIL, radio frequency: no. 16 AWG wire, silver plated, 0.940 in. o/a lg; Communication Electronics, Inc. 1461-1.	Input coupling inductor.	A2L1				1	9

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A2L2*	COIL, radio frequency: modified R.F. stator, 2.120 in. o/a lg; Communication Electronics, Inc. 1265.	Part of RF tuning circuit.	A2L2, A2L3, A2L4, A2L5				4	9
A2L3*	COIL, Same as A2L2.	Part of RF tuning circuit.						9
A2L4*	COIL, Same as A2L2.	Part of RF tuning circuit.						9
A2L5*	COIL, Same as A2L2.	Part of RF tuning circuit.						9
A2L6*	COIL, radio frequency: no. 18 AWG wire, silver plated, 1.460 in. o/a lg; Communication Electronics, Inc. 1462-2.	Couples oscillator signal and RF signal to mixer.	A2L6				1	9
A2L7*	COIL, radio frequency: oscillator stator assembly, silver plated; Communication Electronics, Inc. 1301.	Part of a tuned circuit.	A2L7				1	9
A2L8*	COIL, radio frequency: copper strip, 0.120 in. thk, 0.140 in. w, 0.710 in. lg o/a dim; Communication Electronics, Inc. 1973.	RF choke	A2L8				1	9
A2L9*	COIL, radio frequency: 10 turns, no. 26 wire, closewound; Communication Electronics, Inc. 1466-4.	RF choke	A2L9				1	9
A2L10*	COIL, radio frequency: 14 turns, no. 26 wire, closewound; Communication Electronics, Inc. 1466-3.	RF choke	A2L10, A2L11				2	9
A2L11*	COIL, Same as A2L10.	RF choke						9

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A2L12	NOT USED							
A2L13*	COIL, radio frequency: 4 turns, no. 26 wire, closewound; Communication Electronics, Inc. 1466-1.	Part of coupling network.	A2L13				1	9
A2L14*	COIL, radio frequency: 5 turns, no. 26 wire, closewound; Communication Electronics, Inc. 1466-2.	RF choke	A2L14				1	9
A2L15*	COIL, radio frequency: 14 1/2 turns, no. 26 SNS wire, closewound, slug tuning, 1.255 in. lg; Communication Electronics, Inc. 1471-2.	Part of coupling network.	A2L15				1	9
A2L16*	COIL, radio frequency: 33 turns, closewound, no. 40 SF conductor, plastic coil form, 0.438 in. dia, 1.497 in. lg o/a dim., 2 solder lug terminals; Communication Electronics, Inc. 1472-12.	Neutralization	A2L16				1	9
A2L17*	COIL, radio frequency: 13 turns, closewound, no. 30 SF conductor, plastic coil form, 0.438 in. dia, 1.497 in. lg o/a dim., 2 solder lug terminals; Communication Electronics, Inc. 1472-13.	Part of coupling network.	A2L17				1	9
A2R1	NOT USED							
A2R2	RESISTOR, fixed, composition: 5.6K ±5 pct, 1/4W; per MIL-R-11.	Load resistors	A2R2	RC07GF562J		5905-691-0195	1	9
A2R3	RESISTOR, Same as A1R13.	Dropping						9
A2R4	RESISTOR, Same as A1R6.	Load resistor						9

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A2R5	RESISTOR, Same as A1R1.	Dropping						9
A2R6	RESISTOR, fixed, composition: 47K ±5 pct, 1/4W; per MIL-R-11.	Isolation	A2R6, A2R8	RC07GF473J		5905-683-2246	2	9
A2R7	RESISTOR, fixed, composition: 68 ohms ±5 pct, 1/4W; per MIL-R-11.	Biasing	A2R7	RC07GF680J		5905-683-2235	1	9
A2R8	RESISTOR, Same as A2R6.	Grid leak resistor.						9
A2R9	RESISTOR, fixed, composition: 10 ohms ±5 pct, 1/4W; per MIL-R-11.	Parasitic suppressor.	A2R9	RC07GF100J		5905-817-7971	1	9
A2R10	RESISTOR, Same as A1R1.	Isolation						9
A2R11	RESISTOR, fixed, composition: 12K ±5 pct, 1/2W; per MIL-R-11.	Isolation	A2R11	RC20GF123J		5905-279-3502	1	9
A2V1	ELECTRON TUBE, Same as A1V4.	Local oscillator.						9
A2V2	ELECTRON TUBE: nuvistor triode; per EIA 6CW4.	IF amplifier	A2V2, A2V3			5960-956-8414	2	9
A2V3	ELECTRON TUBE, Same as A2V2.	IF amplifier						9
A2XV1	SOCKET, electron tube: for 7486 tube, 0.468 in. w, 0.812 in. h, 0.875 in. lg, mtd by two 2-56 screws, contacts berryllium copper, insulator low-loss molded material; Jettron 86-000.	Mounts A2V1.	A2XV1			5960-084-8518	1	
A2XV2	SOCKET, Same as A1XV3.	Mounts A2V2.						
A2XV3	SOCKET, Same as A1XV3.	Mounts A2V3.						

7611	CONTRACTOR COMMUNICATION ELECTRONICS INCORPORATED				CONTRACT NO. DA18-119-AMC-02854(X)			
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Fig. 10 A3	POWER SUPPLY subassembly: etched circuit plug-in card, epoxy resin glass base laminate grade G10 with 1-oz copper (1-side); 2.600 in. w by 2.000 in. h by 0.320 in. thk o/a dim; 180 vac and 12.0 vac input, -24 vdc, +180 vdc, -6.3 vdc output; Communication Electronics, Inc. 7611.	Rectifies ac input from T1 and provides dc voltages for use in unit.	A3				1	6
A3CR1	SEMICONDUCTOR DEVICE, diode: silicon; per EIA 1N3253.	Rectifier	A3CR1, A3CR2 A3CR3, A3CR4			5961-964-5478	4	10
A3CR2	SEMICONDUCTOR, Same as A3CR1.	Rectifier						10
A3CR3	SEMICONDUCTOR, Same as A3CR1.	Rectifier						10
A3CR4	SEMICONDUCTOR, Same as A3CR1.	Rectifier						10
A3CR5	SEMICONDUCTOR DEVICE, diode: silicon; per EIA 1N3255.	Rectifier	A3CR5, A3CR6			5961-964-5242	2	10
A3CR6	SEMICONDUCTOR, Same as A3CR5.	Rectifier						10
A3CR7	SEMICONDUCTOR DEVICE, diode: silicon; per MIL-S-19500.	Regulator	A3CR7	1N753A		5961-752-6121	1	10
A3R1	RESISTOR, fixed, composition: 430 ohms ±5 pct, 1/2W; per MIL-R-11.	Dropping	A3R1	RC20GF431J		5905-279-3512	1	10
A3R2	RESISTOR, fixed, composition: 100K ±5 pct, 1/4W; per MIL-R-11.	Dropping	A3R2	RC07GF104J		5905-686-3129	1	10

Main Chassis | CONTRACTOR: COMMUNICATION ELECTRONICS INCORPORATED | CONTRACT NO.: DA18-119-AMC-02854(X)

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C1	CAPACITOR, fixed, electrolytic: 1 section, aluminum foil, 500 μf, 25 wvdc, 1.000 in. dia, 2.000 in. h w/twist lock mtg tabs on bottom, metal can, uninsulated, vertical mtg; General Electric 43F8123BA2.	Filtering	C1				1	6
C2A,B	CAPACITOR, fixed, electrolytic: 2 sections, aluminum foil, both sections 15 μf, 350 wvdc, 1.000 in. dia, 2.000 in. h w/twist lock mtg tabs on bottom, metal can, uninsulated, vertical mtg; General Electric 43F2299BB1.	Filtering	C2A,B				1	6
CR1	NOT USED							
CR2	NOT USED							
CR3	NOT USED							
CR4	NOT USED							
CR5	NOT USED							
CR6	NOT USED							
CR7	NOT USED							
CR8	SEMICONDUCTOR DEVICE, diode: silicon; per MIL-S-19500.	Regulator	CR8	1N3011B		5961-892-0913	1	7

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DS1	LAMP, incandescent: 6.3 v, 0.15 amp, 3,000 hr rated life, T3-1/4 bulb, miniature bayonet base, 0.406 in. dia, 1.187 in. lg; General Electric 47.	Dial Lamp.	DS1, DS2			6240-155-8706	2	7
DS2	LAMP, Same as DS1.	Dial lamp.						7
DS3	LAMP, incandescent: 6 v, 0.04 amp, 1,000 hr rated life, T1-3/4 bulb, single contact midget flange base, 0.056 in. dia, 0.625 in. lg; Chicago Miniature 345.	Power ON indicator.				6240-910-7144	1	6
F1	FUSE, cartridge: slow-blow, 0.3 amp, 250 v, 3 AG size glass fuse, 0.250 in. dia, 1.250 in. lg, ferrule type terminals; Bussman MDL 3/10	Overload protection.	F1			5920-235-8362	1	4
F2	FUSE, cartridge: slow-blow, 0.15 amp, 250 v, 3 AG size glass fuse, 0.250 in. dia, 1.250 in. lg, ferrule type terminals; Bussman MDL 15/100.	Additional overload protection with 230 vac input.	F2			5920-503-0454	1	4
J1	NOT USED							
J2	CONNECTOR, receptacle, electrical: Type N; per MIL-C-3608.	235-500 mc RF input connector.	J2, J3, J4	UG1052/U		5935-201-8443	3	4
J3	CONNECTOR, Same as J2.	RF input connector (direct).						4
J4	CONNECTOR, Same as J2.	490-1000 mc RF input connector.						4
J5	CONNECTOR, part of K1.	Output connector.						4

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J6	CONNECTOR, part of K2.	Relay input connector.						6
J7	CONNECTOR, part of K2.	Relay output connector						6
J8	CONNECTOR, part of K2.	Relay input connector.						6
J9	CONNECTOR, part of K1.	Relay input connector.						6
J10	CONNECTOR, part of K1.	Relay input connector.						6
K1	SWITCH, radio frequency transmission line: coils 26 vdc, 280 ohms, SPDT remote operation function, three BNC connectors (J5, J9, J10), 2750 mc freq, 100 w power, 1.562 in. lg, 2.000 in. h; Amphenol 317-010202-3.	Selects RF signals from low or high band and applies them to output jack.	K1				1	6
K2	SWITCH, radio frequency transmission line: coils 26 vdc, 280 ohms, SPDT remote operation function, three BNC connectors (J6, J7, J8), 2750 mc freq, 100 w power, 1.562 in. lg, 2.000 in. h; Amphenol 318-010382-3.	Selects DIRECT signal input or low band signal output and applies them to K1.	K2			5985-975-0253	1	6
P1	CONNECTOR, plug, electrical: type BNC, 1500 vac, 50 ohms impedance, 1.062 in. lg; AMP 2-329082-2.	Connects W2 to A1J1.	P1, P2, P3, P4, P5				5	7
P2	CONNECTOR, Same as P1.	Connects W1 to A2J1.						6
P3	CONNECTOR, Same as P1.	Connects W3 to A2J8.						6
P4	CONNECTOR, Same as P1.	Connects W4 to J7.						6
P5	CONNECTOR, Same as P1.	Connects W4 to J9.						6

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P6	CONNECTOR, plug, electrical: type BNC, 1500 vac, 50 ohms impedance, 1.062 in. lg; AMP 2-330058-1.	Connects W5 to J6.	P6, P8				2	6
P7	CONNECTOR, plug, electrical: 1 female contact, 1 connector mating end, low-loss plastic dielectric, 50 ohms impedance, straight shape, 0.234 in. dia, 0.593 in. lg o/a dim.; Amphenol 27-7.	Connects W5 to A1J2.	P7, P9			5935-881-6392	2	6
P8	CONNECTOR, Same as P6.	Connects W6 to J10.						6
P9	CONNECTOR, Same as P7.	Connects W6 to A2J2.						6
P10	CORD ASSEMBLY, electrical: three 18 AWG wire size conductors, seperately insulated, rubber jacketed, 7 amp, 125 v rating, one end terminated with Cornish 72 connector plug, other end unprocessed, 6 ft lg o/a; Cornish Wire 01753-001.	Power plug and cord	P10			5995-226-0491	1	
Q1	TRANSISTOR: NPN, germanium; per EIA 2N1544.	Series regulator.	Q1			5961-833-6322	1	6
R1	NOT USED							
R2	RESISTOR, fixed, composition: 1K ±5 pct, 2W; per MIL-R-11.	Part of a voltage divider.	R2	RC42GF102J			1	7
R3	RESISTOR, fixed, composition: 2K ±5 pct, 2W; per MIL-R-11.	Part of a voltage divider.	R3	RC42GF202J		5905-256-8355	1	7
R4	NOT USED							

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R5	NOT USED							
R6	RESISTOR, variable: 100K ±10 pct, 2W, composition element, 1.000 in. dia, 0.812 in. lg shaft, 0.250 in. dia 3/8-32 bushing, linear taper; Allen-Bradley JA1N052P104UA.	Fine tuning control.	R6				1	7
R7	RESISTOR, fixed, composition: 5.1K ±5 pct, 1/4W; per MIL-R-11.	Limiting resistor	R7	RC07GF512J		5905-683-2241	1	7
S1	SWITCH, toggle: SPDT, 3 amps at 125 vac, 1 amp at 250 vac, 0.531 in. w, 1.062 in. lg, 1.344 in. h o/a dim., 2 solder lug terminals; Cutler-Hammer 8282K14.	POWER switch	S1			5930-112-5105	1	6
S2	SWITCH, slide: DPDT, 115/230 vac, 0.75 amp, slide button type actuating mechanism, 0.531 in. w, 0.593 in. h, 1.375 in. lg, 6 solder lug terminals, flange mtd; Muter 4633.	115/230 vac power switch.	S2			5930-977-1760	1	6
S3A, B, C, D	SWITCH, rotary: 4 pole, 3 position 2 sections, 2 poles per section, silicone glass insulation, 1.000 in. h, 0.937 in. w, 3/8-32 thd mtg bushing, 0.250 in. dia shaft; Communication Electronics, Inc. 1128-07.	Bandswitch	S3A, B, C, D				1	6
T1	TRANSFORMER, power, stepdown and step-up: hermetically sealed, 2.120 in. h, 2.560 in. w, 3.000 in. lg, 115 v, 50-400 cps, single phase; Communication Electronics, Inc. 1523.	Supplies high and low ac voltages for power supply and dial lamps.	T1				1	6

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W1	CABLE ASSEMBLY, radio frequency: coaxial arrangement, RG55/U cable, one UG1052/U receptacle on one end, one 2-329082-2 plug on other end, solid copper conductor, 14.250 in. lg; Communication Electronics, Inc. 30020-266.	Connects J4 to A2J1.	W1				1	6
W2	CABLE ASSEMBLY, radio frequency: coaxial arrangement, RG55/U cable, one UG1052/U receptacle on one end, one 2-329082-2 plug on other end, solid copper conductor, 9.000 in. lg; Communication Electronics, Inc. 30020-267.	Connects J2 to A1J1.	W2				1	6
W3	CABLE ASSEMBLY, radio frequency: coaxial arrangement, RG55/U cable, one UG1052/U receptacle on one end, one 2-329082-2 plug on other end, solid copper conductor, 9.000 in. lg; Communication Electronics, Inc. 30020-268.	Connects J3 to J8.	W3				1	6
W4	CABLE ASSEMBLY, radio frequency: coaxial arrangement, RG55/U cable, one 2-329082-2 plug on each end, solid copper conductor, 7.250 in. lg; Communication Electronics, Inc. 30020-269.	Connects J7 to J9.	W4				1	6

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W5	CABLE ASSEMBLY, radio frequency: coaxial arrangement, RG174/U cable, one Amphenol 27-7 plug on one end, one AMP 2-33058-1 plug on other end, solid copper conductor, 11.000 in. lg; Communication Electronics, Inc. 30020-270.	Connects A1J2 to J6.	W5				1	6
W6	CABLE ASSEMBLY, radio frequency: coaxial arrangement, RG174/U cable, one Amphenol 27-7 plug on one end, one AMP 2-330058-1 plug on other end, solid copper conductor, 20.500 in. lg; Communication Electronics, Inc. 30020-271.	Connects A2J2 to J10.	W6				1	6
XA3	CONNECTOR, receptacle, electrical: 11 contacts, 1 connector mating end, low-loss plastic dielectric, 0.453 in. w, 1.000 in. h, 3.475 in. lg o/a dim.; Elco 00-5002-011-103-002.	Mounts A3	XA3				1	7
XDS1	LAMPHOLDER: accommodates one miniature bayonet base lamp, 125 v, cadmium plated, steel shell, 2 solder lug terminals, clip mtd; Leecraft 7-02.	Mounts DS1	XDS1, XDS2			6250-299-7170	2	7
XDS2	LAMPHOLDER, Same as XDS1.	Mounts DS2						7

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XDS3	LIGHT, indicator: red translucent plastic lens, stove pipe shape, accommodates one incandescent T1-3/4 lamp, 6 v, 0.04 amp, flange mtd in 15/32 in. hole, 0.500 in. dia, 0.719 in. lg o/a dim.; solder terminal; Dialight 107-1930-0971.	Mounts DS3	XDS3			6220-722-9701	1	6
XF1	FUSEHOLDER: 30 amp, 250 v; per MIL-F-19207.	Mounts F1	XF1, XF2	FHN26G		5920-892-9311	2	4
XF2	FUSEHOLDER, Same as XF1.	Mounts F2						4
XQ1	SOCKET, transistor: accommodates T0-3 transistor, 2 contact positions, 0.430 in. c to c, phosphor bronze contacts, plastic body, 0.171 in. h, 1.000 in. w, 1.571 in. lg, 2 solder lug terminals; Augat 8038-1G1.	Mounts Q1	XQ1			5935-015-3678	1	7
	HANDLE, bow: 2.000 in. mtg centers, 0.312 in. dia, 1.312 in. h, chrome plated; Cambridge Thermionic 1250-1.	Protects rear apron connectors and provides method of handling.				5340-860-6610	2	
	HANDLE, bow: 3.000 in. mtg centers, 0.312 in. dia, 1.312 in. h, chrome plated; Cambridge Thermionic 1252-1.	Protects front panel controls and provides method of handling				5340-855-1033	2	
	KNOB: molded phenolic, 1.266 in. dia, 1.312 in. h, aluminum bushing for 0.250 in. dia shaft, gray color; Communication Electronics, Inc. 1028-1.	Tuning knob					2	

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	KNOB: molded phenolic, 0.680 in. dia, 0.782 in. h, aluminum bushing for 0.250 in. dia shaft, gray color; Raytheon G70-2-2	Tuning knob				5355-655-8424	2	

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